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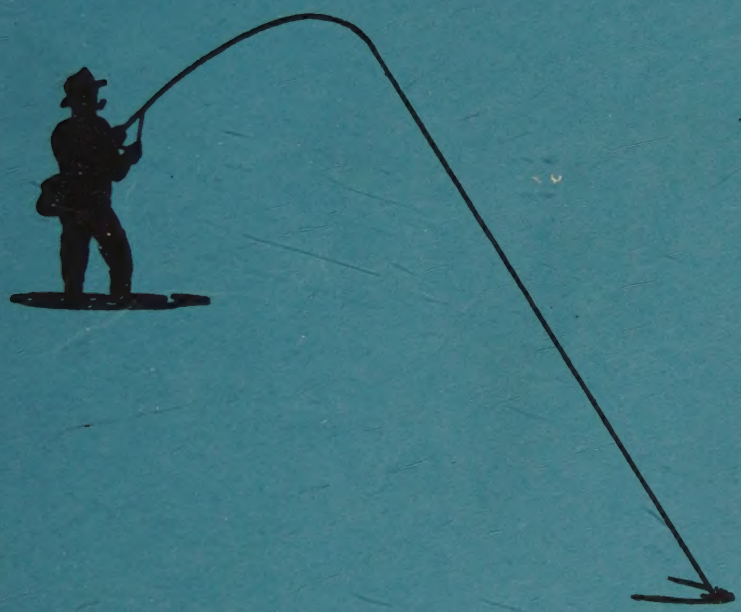

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Sport Fishery Abstracts

An abstracting service for fishery research and management

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Sport Fishery Abstracts is intended to furnish fishery biologists in government agencies and educational institutions with abstracts of the current literature in sport fishery research and management. Abstracts of papers on limnology, ecology, natural history and other fields of specialization will be included when the subject has application to the conservation of sport fish and the restoration of sport fishing.

One volume consisting of not more than four numbers will be issued each year. Each number contains separate Author and Subject indexes, with the final number of each volume containing cumulative indexes.

The last number of each volume contains a list of publications screened for appropriate material. Suggestions for improving the usefulness and coverage of Sport Fishery Abstracts are solicited.

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Prepared in the Branch of Federal Aid
Raymond E. Johnson, Chief
William R. Beckmann, Editor
Geneva T. Thompson, Asst. Editor

1921. Nakagome, Jun. 1958. MORPHOMETRIC COMPARISON OF YELLOWFIN TUNA FOR THE WESTERN, MIDDLE AND EASTERN PARTS OF THE INDIAN OCEAN. (In Japanese with English abstract.) Bulletin of the Japanese Society of Scientific Fisheries, Vol. 24, No. 3, pp. 165-168.

There are reports on the morphometric comparison of the yellowfin tuna obtained between the middle and eastern parts of the Indian Ocean, but none is found on the comparison of the specimens taken among the western and other divisions of the Ocean. This paper deals with the investigative results of the Sagamimaru, research boat of the Kanagawa Prefectural Fisheries Experimental Station.

The measurements of body parts were compared among four areas in the western part of the Indian Ocean, and also among the western, middle and eastern divisions of the Ocean.

The lengths from the tip of snout to insertions of pectoral fin, the 1st dorsal fin and ventral fin differ considerably for respective areas, but those from there to insertions of the 2nd dorsal fin and anal fin and depths do not differ for respective divisions. This means that the anterior parts of the body differ for respective areas.

The anterior body parts of fishes obtained from the middle and eastern divisions of the Indian Ocean are longer, those parts of them taken from the areas W_1, W_2 and W_5 are shorter and those of fishes from the area W_4 are median length between the two groups. Area W_4 is situated in the southern part of 3°30'-4°00'S., and more westward than area W_5 and areas W_1, W_2 and W_5 are located in the northern part of 1°00'-2°30'S.

Accordingly, it may be considered that the anterior body parts of fish, obtained from the middle and eastern divisions of the Indian Ocean, are long, those lengths of fish from the southern part of 3°30'-4°00'S., median, and those of fish from the northern part of 1°00'-2°30'S., short. (Auth. abst.)

1922. Nakagome, Jun. 1958. ON THE SEASONAL VARIATION OF SWIMMING LAYERS OF YELLOWFIN TUNA, BIG EYED TUNA AND BLACK MARLIN IN THE AREA OF CAROLINE AND MARSHALL ISLANDS--II. RELATION BETWEEN SEASONAL VARIATION OF SWIMMING LAYER AND VERTICAL DISTRIBUTION OF WATER TEMPERATURE. (In Japanese with English abstract.) Bulletin of the Japanese Society of Scientific Fisheries, Vol. 24, No. 3, pp. 169-172.

Data on the swimming layer were quoted from the author's previous report, and those on the vertical distribution of water temperature in the areas B and C were obtained from the investigations by the "Sagamimaru", the former research boat of the Kanagawa Prefectural Fisheries Experimental Station, the "Machimaru", the research boat of the Wakayama Pref. Fish. Exp. Stat. and the "Iwatemaru", that of the Iwate Pref. Fish High School.

Records on the surface water temperature and rate of catch of black marlin in area A have been obtained from the investigations by the Kanagawa Pref. Fish. Exp. Stat. and the Nankai Regional Fisheries Research Laboratory. Data on the vertical distribution of water temperature and rate of catch of black marlin in the area of Lat. 10°-30°N., Long. 125°-135°E. were quoted from the report by Ueyanagi.

The variation of swimming layers of yellowfin tuna and big eyed tuna is not concerned with the variation of water temperature. Therefore, it is supposed that the swimming layer of the fish mentioned above would be independent of the water temperature.

The shoal of black marlin distributes mostly in the habitat layer of 24°-25°C., and its swimming layer changes seasonally with the vertical removal of water temperature. But the vertical transition of swimming layer is less than that of water temperature for the reasons that when the habitat layer comes up nearer to the surface the shoal swims in most cases in the under layer of 22°-24°C., and when the layer of 24°-25°C. goes down nearer to the bottom the fish remain mostly to the upper layer of 25°-27°C.

The better fishing rate of black marlin would be evaluated if we could estimate its swimming layer from the phenomena above mentioned. (Auth. abst.)

1923. Nakagome, Jun. 1958. ON THE SEASONAL VARIATION OF SWIMMING LAYERS OF YELLOWFIN TUNA, BIG EYED TUNA AND BLACK MARLIN IN THE AREA OF CAROLIN AND MARSHAL ISLANDS--III. ON THE RELATIONSHIP BETWEEN SEASONAL VARIATION OF SWIMMING LAYER AND RATE-OF-CATCH. (In Japanese with English abstract.) Bulletin of the Japanese Society of Scientific Fisheries, Vol. 24, No. 3, pp. 173-175.

Data on the swimming layer were quoted from the author's previous report and those on the rate-of-catch of yellowfin tuna in the area C, of big eyed tuna in the areas c_1, c_2, c_3 and of black marlin in the areas A and C have been obtained from the investigations by the Kanagawa Prefectural Fisheries Experimentatl Station and Nankai Regional Fisheries Research Laboratory.

The variation of rate-of-catch of yellowfin tuna and big eyed tuna is presumably correlated with that of swimming layer; when the depth from the surface to the swimming layer is shallower, the rate-of-catch is high, when it is deeper, the rate is low.

In the case of black marlin the correlation is vice versa; in the shallower swimming layer, the rate is low, in the deeper one, it is high. The shoal of black marlin migrates seasonally between the northern and southern areas owing to the variation of water temperature. The rate-of-catch of the species is more considerably affected by the migration of a shoal than by the variation of swimming layer.

The better fishing rate would be evaluated if we could estimate its swimming layer from the phenomena above mentioned. (Auth. abst.)

1924. Mitani, Fumio. 1958. FEEDING HABITS OF THE YELLOW-TAIL, SERIOLA QUINQUERADIATA T. & S., CAUGHT IN WAKASA BAY, THE JAPAN SEA, BASED ON ITS STOMACH CONTENTS - I. FOOD ELEMENTS AND THEIR SEASONAL VARIATION. (In Japanese with English abstract.) Bulletin of the Japanese Society of Scientific Fisheries, Vol. 24, No. 3, pp. 176-181.

This report is of some feeding habits, one of the several results brought about by the author in his yellow-tail investigations.

Stomach contents of the 107 yellow-tails, caught mainly by trap-nets and angling in Wakasa Bay, the Japan Sea, from December of 1956 to November of 1957, are analyzed qualitatively and quantitatively with a view to clarifying the food elements and their variations with the four seasons. Food elements of major importance include horse mackerel (Trachurus japonicus), anchovy (Engraulis japonica), pilchard (Sardinops melanosticta), and common squid (Ommastrephes sloani pacificus). Those of secondary importance consist of cardinal fish (Apogon semilineatus), red porgy (Chrysophrys major), snapper (Parapristipoma trilineatum), silver perch (Leiognathus nuchalis), barracuda (Sphyraena japonica), chub mackerel (Scomber japonicus), puffer (Fugu niphobles), porgy (Argyrops bleekeri), and stargazer (Uranoscopus japonicus).

The present study has shown an increase of the horse mackerel and a decrease of chub mackerel either in occurrence or in amount, being widely different from the results brought about by the previous investigators about twenty years ago. It is a remarkable fact that recently the catch of horse mackerel in Wakasa Bay has remained unchanged, while the catch of the chub mackerel in the same area has decreased remarkably, which is presumably the case with the other fishing grounds in the Japan Sea.

There may be some probable correspondence between the increase of the horse mackerel in the composition of the yellow-tail's stomach contents and a good catch of the same species, and also between the decrease of the chub mackerel in the composition of stomach contents and a poor catch of the same species. It is found that there is such correlation between the composition of the stomach contents of the yellow-tail and the seasonal fluctuation in the catch of several fishes.

Judging from these facts, a qualitative and quantitative analysis of the food composition in the stomachs of large fish, such as the yellow-tail, will enable us safely to predict the relative abundance of some useful fish.

There is no marked difference in the composition between the stomach contents of the young yellow-tail and those of the adult one. (From auth. abst.)

1925. Mitani, Fumio. 1958. FEEDING HABITS OF THE YELLOW-TAIL, SERIOLA QUINQUERADIATA T. & S., CAUGHT IN WAKASA BAY, THE JAPAN SEA, BASED ON ITS STOMACH CONTENTS - II. DAILY CHANGE OF FEEDING ACTIVITY AND VARIATION IN FEEDING ACTIVITY WITH ITS GROWTH. (In Japanese with English abstract.) Bulletin of the Japanese Society of Scientific Fisheries, Vol. 24, No. 3, pp. 182-185.

Quantitative analysis of the feeding habits of the yellow-tail, Seriola quinqueradiata T. and S., particularly the daily change of the feeding activity and the feeding amount varying with growth, based on the stomach contents of the 262 individuals caught in Wakasa Bay, the Japan Sea, during the period from December of 1956 to January of 1958, revealed that:

1) Fish caught in the morning have more contents in the stomach than those caught in the evening. Accordingly, the fish feed voraciously at dawn and less in the daytime; food taken by the fish in the morning may have been digested by the evening.

2) Rate of feeding (food weight/body weight x 100) varies as the fish grows, first rapidly and then gradually. Hence, the digestion of younger fish is more vigorous than that of older fish. Consequently, younger fish must be able to migrate throughout the wide region between the northern and southern areas of the Japanese waters, while older ones become so dull and slack in their activity that some of them are apt to settle within a relatively limited area. What is called "a bank shoal" may be formed in this way. (From auth. abst.)

1926. Hoshina, Toshikazu. 1958. TISSUE LEVELS OF THIASIN IN RAINBOW TROUT. (In Japanese with English abstract.) Bulletin of the Japanese Society of Scientific Fisheries, Vol. 24, No. 2, pp. 100-102.

The tissue concentrations of thiasin (3, 4-dimethyl-5-sulfanilamido-isoxazole) given to rainbow trout at the rate of 100, 150, and 200 milligrams per one kilogram of fish per day were examined. The rainbow trout, weighing on the average 15 grams per fish, were kept in troughs and fed with the drug-containing-food once a day at the rate of about 2.5% of fish weight per day. The water had the temperature of 12.7~14.0°C during the experiments.

The determinations were made by extracting the ground tissue in alcohol, treating the extract with Tsuda's reagent (β-diethyl aminoethyl-a-naphthyl amine oxalate) and proceeding with a photo electric colorimeter. The results are presented. (Auth. abst.)

1927. Koike, Atushi, Kenji Kanda and Mitio Ogura. 1958. A PREPARATIVE STUDY WITH TROUT FOR THE SALMON GILL-NET. (In Japanese with English abstract.) Bulletin of the Japanese Society of Scientific Fisheries, Vol. 24, No. 1, pp. 5-8.

The behaviour of a rainbow trout school in the neighbourhood of experimental net was observed. The colours of net examined were blue-green (mizu-iro), cutch-brown (katti-iro), and gray (usuzumi-iro). Offensive effect of these colours upon the fish passage increased in the daytime in the order:

blue-green< gray< cutch-brown. Another order prevailed in the twilight hour: gray< blue green< cutch-brown. This suggests that also the weather makes an influential factor. As to the colour of net, in the twilight some parallelism exists between the visibility of a net to human eye and the tendency of fish entanglement in that net. From these results it may be presumed that as a salmon net operated usually all night cutch-brown net will not efficiently catch the fish. (From auth. abst.)

1928. Koike, Atushi. 1958. COMPARATIVE EFFICIENCY OF DIFFERENTLY COLOURED GILL-NET IN THE NORTH SEA SALMON FISHING. (In Japanese with English abstract.) Bulletin of the Japanese Society of Scientific Fisheries, Vol. 24, No. 1, pp. 9-12.

Salmon gill-nets intentionally coloured blue-green (mizu-iro), cutch-brown (katti-iro), and gray (usuzumi-iro), respectively, were examined in an actual operation on the fishing ground in the northern waters. Counting the fish coming entangled in each colored net, it was found that the fish-entangling abilities of these nets arrange in the following order: gray=blue-green> cutch-brown. Since the present results deal with some different kinds of salmon and trout together, a further examination will be necessary with each fish species separately, and also with various degrees of lightness in water. (Auth. abst.)

1929. Raney, Edward C. 1958. THE STRIPED BASS. Bureau of Commercial Fisheries, Fishery Leaflet No. 451, 6 pgs.

The magnitude of the nation's striped bass fishery, taxonomic relationships, geographical distribution, races, migrations, reproduction, rate of growth, and conservation problems are covered.

1930. Weston, D. E. 1958. OBSERVATIONS ON A SCATTERING LAYER AT THE THERMOCLINE. Deep-sea Research, Vol. 5, No. 1, pp. 44-50.

A strong and extensive sound scattering layer has been observed in the North Sea, at the depth of the summer thermocline. The behaviour of the scatterers in daylight and at night is discussed. Calculations show that the echo is not directly due to the physical discontinuity, confirming the usual biological theory for its origin. There is a probable identification of traces due to both plankton animals and fish. The scattering layer also acts as a marker for the thermocline, making possible some continuous measurements of thermocline depth. (Auth. abst.)

1931. Hassan, E. M. 1958. ON THE WIND DRIVEN OCEAN CIRCULATION. Deep-sea Research, Vol. 5, No. 1, pp. 36-43.

A model of a wind-driven ocean was considered to determine the vertical structure of the horizontal currents. The most restrictive assumptions were the absence of vertical motion and the constancy of the coefficient of exchange of momentum. The results of the model indicate that the current pattern in three dimensions is cellular. (Auth. abst.)

1932. King, Willis. 1958. PROGRAM OF THE BRANCH OF FISHERY MANAGEMENT SERVICES. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 62-66.

The legal authority and objectives for this new Branch of the Bureau of Sport Fisheries and Wildlife are discussed. Management services on Federal lands, cooperation on State fishery programs, and plans for new activities are covered.

1933. Huish, Melvin T. 1958. STUDIES OF GIZZARD SHAD REDUCTION AT LAKE BEULAH, FLORIDA. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 66-70.

Four experiments with 0.1 ppm or less of 5 percent emulsified rotenone were conducted at Lake Beulah, Florida. Lake Beulah, an eighteen-acre lake with an average depth of 14.9 feet characteristically had a heavy plankton production.

Estimated pounds of gizzard shad killed progressively declined during the four experiments although concentrations of rotenone were increased. The first kill was estimated at 23,455 pounds of shad; second kill, 7,976 pounds; third kill, 1,528 pounds; and fourth kill, 1,060 pounds. Small numbers of fish of other species were also killed.

Length-frequency studies of gizzard shad indicated an over populated condition existed at the time of the first poisoning. Thereafter reproduction and rapid growth of this species occurred. Evidence exists that threadfin shad may have been eliminated from Lake Beulah following the use of the selective poisoning technique.

Total kill calculations included results from bottom sample screens. An inverse relationship existed between average temperature and the percent of all fish killed which did not float to the surface. (Auth. abst.)

1934. Zeller, H. D., and A. B. Montgomery. 1958. PRELIMINARY INVESTIGATIONS OF CHEMICAL SOIL AND WATER RELATIONSHIPS AND LIME TREATMENT OF SOFT WATER IN GEORGIA FARM PONDS. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 71-76.

A general classification of pond waters according to hydrogen ion and total hardness of calcium and magnesium is correlated with the major soil regions in the state. Specific correlation between Piedmont soils and Coastal Plain soils are apparent.

Limited data is available on lime treatment of soft waters and relationships to fertilization programs. Pond bottom soil analysis before and after liming exhibit beneficial nutrient releases following treatment, and water concentrations of calcium and magnesium and hydrogen ion are presented before and after lime treatment.

The efficiency of fertilization programs have been improved following lime treatment and amounts of fertilizer required for optimum results reduced. Pending additional study and results, liming may be a necessary constituent in fertilization programs of ponds within certain soil areas of Georgia. (Auth. abst.)

1935. Martin, R. G. 1958. INFLUENCE OF FISHING PRESSURE ON BASS FISHING SUCCESS. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 76-82.

Analysis of complete creel census data including estimates of total harvest and fishing pressure for 5 public and 2 private ponds revealed almost without exception an inverse relationship between fishery pressure and catch per unit of effort.

An increase in fishing pressure seldom resulted in increased harvests from public ponds, but was reflected by a reduced catch per unit effort. This suggests that near maximum harvests are being attained by observed levels of fishing pressure. Relatively high tag returns, 30-50 percent, from these same waters produce additional evidence of this supposition. However, it likewise is apparent that the degree of fishing pressure recorded from these waters is not sufficient to adversely affect future harvest or reproduction. The average harvest remained essentially the same throughout the six years of the study period and reproduction was excellent at all times.

The amount of fishing pressure these unmanaged public ponds can support without substantial reduction in fishing success appears exceptionally low. The yield of bass per acre is also disappointingly low. An average of 19 fishing trips per acre at five public ponds resulted in the harvest of 3.6 bass per acre, averaging approximately one pound, at a rate of .2 bass per trip. These findings of low harvest and fishing pressure on unmanaged public waters emphasize the low sport fishing potential of such waters and the need for better management practices. (From auth. summ.)

1936. Carter, Bernard T. 1958. WHAT SIGNIFICANT INFORMATION CAN BE GAINED FROM ROTENONE POPULATION STUDIES IN IMPOUNDMENTS. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 82-84.

The practice of conducting population studies in impoundments by poisoning and recovering all fish from a one-acre or larger area can provide usable information on success and survival of reproduction, age and growth of reservoir species, success of newly introduced species, and the species present and their relative abundance. This practice will not accurately measure species composition quantitatively, determine standing crop, determine adult or large fish abundance, determine abundance of pelagic or school fish, nor provide information of value in food habit studies.

1937. Chance, Charles J. 1958. HOW SHOULD POPULATION SURVEYS BE MADE. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, pp. 84-89.

A population sampling procedure, followed by biologists working on reservoirs under control of the Tennessee Valley Authority, and limited to the rotenone method, is described. Weaknesses and suggested areas of improvement are covered.

1938. Moody, Harold L. 1958. AN EVALUATION OF FISH POPULATION STUDIES BY FLORIDA HAUL SEINE. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 89-91.

The technique of operation of the haul seine as traditionally used in the large fresh water bodies of Florida is discussed. Limiting factors inherent in the sampling device are enumerated and illustrated by seine catches from several lakes. Rotenone studies from some of these lakes are contrasted with the seine catches. The results of creel census studies in lakes extensively fished by sportsmen, by reflecting proportionate quantities of game fishes similar to quantities taken in the haul seine, are quoted as further validation for its use in qualitative population sampling. Difficulties in quantitative sampling by this method are discussed. It is shown to be of questionable value when employed for approaching absolute terms such as productivity in pounds per acre except in certain special cases. The value of the haul seine for purely relative comparisons is emphasized. (Auth. abst.)

1939. Lambou, Victor W., and Herbert Stern, Jr. 1958. AN EVALUATION OF SOME OF THE FACTORS AFFECTING THE VALIDITY OF ROTENONE SAMPLING DATA. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 91-98.

The factors affecting the validity of rotenone sampling data can be grouped into four general types: (1) the selectivity of the method, (2) variation in the amounts of fish recovered from different samples due to incompleteness of kill and/or pick-up of fish, (3) the sample size and (4) the method used in selecting the sample sites. All four factors are important and need to be considered in the planning of rotenone sampling studies. (Auth. concl.)

1940. Swingle, H. S. 1958. HOW FISH POPULATION SURVEYS SHOULD BE REPORTED. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 103-104.

To facilitate the evaluation and use of population studies, reports should include:

1. A description of the area sampled, including the chemical classification and physical type of water, the type of bottom, depth of water, speed of move-

ment and other information necessary to describe the environment from which the population came.

2. A description of the method of sampling employed in sufficient detail to enable the results to be evaluated and compared with results of other surveys.

3. Methods of measuring the results should be stated. The report should state if an attempt was made to recover fishes of all sizes, and if all fish were weighed or partly weighed and partly estimated. Such information is necessary for evaluation of the reliability of the results.

4. The population composition should be listed by species, with the numbers and weights of fish in each inch-group. A summary of the population should state the pounds per acre where possible, the A_t value, the F/C ratio, and the E values of the component species to facilitate comparisons with other populations containing the same or different species of fishes.

5. The author should summarize and interpret the results in so far as possible. (Auth. abst.)

1941. Snow, J. R. 1958. A PRELIMINARY REPORT ON THE COMPARATIVE TESTING OF SOME OF THE NEWER HERBICIDES. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 125-132.

A simple method for the comparative testing of herbicides for emergent weeds was developed and used over a three-year period to compare the effect of recently introduced herbicides with that obtained from the use of a 2, 4-D ester in a fuel oil carrier.

The herbicides tested included amitrol (3-amino-1, 2, 4-triazol), dalapon (sodium salt of 2, 2 dichloropropionic acid), erbon (2-(2, 4, 5 tricholorophenoxy) ethyl 2, 2 dichloropropionate), Kuron (propylene glycol butyl ether ester of 2-(2, 4, 5 trichlorophenoxy) propionic acid), Kuramine (amine formulation of 2-(2, 4, 5, trichlorophenoxy) propionic acid), CMU (3-(p-chlorophenyl)-1, 1-dimethylurea) and the propylene glycol butyl ether ester of 2, 4-D. These compounds were tested singly and in various combinations of two herbicides. TCA (sodium salt of trichloroacetate) was combined with several of the forms also.

Several species of marginal and emergent weeds were included in the tests such as cattail, sedge, grass, rush and other plants often occurring in shallow waters and pond margins.

On the species of weeds treated, dalapon, amitrol, the propylene glycol butyl ether ester of 2, 4-D and CMU were most effective when used alone. Combinations of TCA-kuron, dalapon-kuron, amitrol-kuron, amitrol-erbon, TCA-erbon, amitrol-dalapon and dalapon-2, 4-D were as effective in killing the vegetation treated as the standard 2, 4-D ester in oil treatment. Generally a combination of two herbicides gave better results than either of the agents used alone. CMU was the only herbicide tested which had strong residual effects although several of the treatments exhibited residual effects extending into the season following the one in which they were applied. (Auth. abst.)

1942. Crawford, Bruce. 1958. PROPAGATION OF CHANNEL CATFISH (ICTALURUS LACUSTRIS) AT STATE FISH HATCHERY. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 132-141.

The methods found to be successful at the Centerton State Fish Hatchery, Arkansas, are described. This description covers the spawning pens, spawning containers, care and conditioning of brood stock for delayed spawning, selection of brood stock, distinguishing sexes, mating fish and preparing nests, replacement of fish in pens, culture ponds and feeding troughs, and handling and feeding of fry.

1943. White, C. E., Jr. 1958. THE SELECTIVITY AND EFFECTIVENESS OF CERTAIN TYPES OF COMMERCIAL NETS IN THE T. V. A. LAKES OF ALABAMA. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 142-151.

From November, 1955, through May, 1956, trammel and riprap nets of 3-3.5- and 4-inch bar mesh and gill nets of 3- and 4-inch bar mesh were fished by resident commercial fishermen under the supervision of State Fisheries Biologists, in T. V. A. lakes of Alabama.

A total of 10, 425 fish which weighed 42, 689 pounds was caught of which 95.4 percent was rough fish. All of the nets were selective in taking rough fish. Whip set trammel nets were the most effective type of net fished, followed by fixed trammel, riprap and gill nets. In general, as the mesh size increased from 3 to 4 inches, the effectiveness of all nets decreased. (Auth. abst.)

1944. Swingle, H. S. 1958. FURTHER EXPERIMENTS WITH TILAPIA MOSSAMBICA AS A POND-FISH. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 152-154.

Ponds stocked April 30 with 80 Tilapia mossambica per acre and drained October 16 produced in the 170-day experiment 1, 480.9 pounds tilapia per acre in a fertilized pond and 3, 224 pounds per acre where feeding was added. Tilapia (1- to 2-inch) stocked into ponds June 13 reached 5 to 8 inches in size in 126 days.

A 2.6-acre pond was stocked April 18-20 with 80 brood tilapia per acre. The pond was fertilized and the fish fed. Tilapia hatching in this pond grew large enough to provide fishing by August 1. In the first 2-week period of fishing, the catch per acre was 1, 222 fish weighing 226 pounds.

These fish feed upon plankton and filamentous algae and may be of value in ponds for the control of the latter. (Auth. abst.)

1945. Tatum, Buford L. 1958. INTRODUCTION

AND SUCCESS OF WHITE BASS (ROCCUS CHRYSOPS) IN NORTH CAROLINA WATERS. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 185-192.

White bass were stocked in ten reservoirs to improve fishing during the summer months when bass and walleye fishing success is very low. In the five successful introductions of this species, gizzard shad were present; in five unsuccessful plants gizzard shad were absent. No other factor or combination of factors is evident which would account for the success or failure. White bass apparently cannot successfully utilize white perch or white crappie.

1946. Crittenden, Edward. 1958. A PRE-IMPOUNDMENT FISHERY STUDY OF NORTH BAY AND ASSOCIATED WATERS, BAY COUNTY, FLORIDA. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 211-219.

This proposed impoundment will create a 5,000-acre body of water in a presently salt water bay. With decreasing salinity following completion of the project, marine fishes should decline in numbers, and fresh water species from tributaries should expand to occupy the reservoir.

Sixty-one species were collected in North Bay and tributaries, of which 34 were fresh water and 27 were marine. Brackish-water stations yielded 31 species, of which 4 were fresh water. Fresh-water stations yielded 37 species of which 6 were marine.

1947. Lawrence, J. M. 1958. ESTIMATED SIZES OF VARIOUS FORAGE FISHES LARGEMOUTH BASS CAN SWALLOW. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 220-225.

From measurements of 1,699 individuals, equations were developed to estimate the mouth width from total length of largemouth bass (Micropterus salmoides). It was found that the most accurate estimates were linear equations that covered total length in 100-millimeter intervals. In addition, the mean mouth widths, maximum depths of body, and weights for each inch-group of total length were tabulated.

Equations were also developed for estimating the total length from the maximum depth of body of the following species: largemouth bass, bluegill, redear, green sunfish, golden shiner, goldfish, and gizzard shad. The mean maximum depths of body and weights for each inch-group of total length for the latter six species were also tabulated.

It was shown in aquarium tests that bass will swallow readily forage fishes whose maximum depths of body are equal to the mouth widths of the bass. From the aforementioned equations, the estimated sizes of the various species of fish a bass of a given total length can swallow were calculated. These estimates are tabulated for each total length inch-group of bass. (Auth. summ.)

1948. Leeper, Ben, Herbert Stern, Jr., and Victor M. Lambou. 1958. SOME USES OF PUNCH CARD METHODS IN THE TABULATION AND ANALYSIS OF FISHERY RESEARCH DATA. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 226-232.

This paper describes punch card methods, some of the problems connected with these methods, and some of the applications to fishery research. Due to the relative ease of handling large masses of data, one of the greatest advantages of mechanical manipulation of data is the ease with which exploratory studies may be made.

1949. Prather, E. E. 1958. PRELIMINARY EXPERIMENTS ON WINTER FEEDING SMALL FATHEAD MINNOWS. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 249-253.

As fathead minnows are in demand for bait fishing principally during the period February to May, and as a large proportion of those produced during the summer months is too small for sale when rearing ponds are drained, supplemental feeding experiments were conducted. Stocking, feeding, and fertilization rates are discussed and costs of production compared.

1950. Stevens, Robert E. 1958. THE STRIPED BASS OF THE SANTEE-COOPER RESERVOIR. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 253-264.

The continued spawning success of striped bass, Roccus saxatilis, within the reservoir during the past three years, in spite of greatly reduced lock operations, is evidence which heavily supports the resident hypothesis.

Striped bass feed heavily upon mayfly nymphs during the spring months, but take clupeoid fish almost entirely for the remainder of the year.

The results of a three-year creel census ending August 31, 1957, shows that the number of striped bass caught and the percent of the total catch which striped bass represent has approximately doubled for the past two years. The average catch per trip has increased from 1.7 fish to 3.0 fish since 1955. Other data demonstrate a decided change in preference to striped bass fishing from other species by fishermen.

An intensive gill net effort between June 5, 1956 and August 6, 1957 took 5,730.4 pounds of fish. Of this total, 60.1 percent was striped bass. The efficiency of the nets in taking striped bass indicates a very large population of this species within the reservoir.

Age and growth were calculated for 322 striped bass. The calculated average total lengths at the end of the first seven years are as follows: I-8.5, II-15.7, III-19.8, IV-22.9, V-25.8, VI-28.5, and

VII-30. 2. The average first year growth is approximately double that reported from New England and the Chesapeake Bay.

Striped bass from the reservoir and tributary streams have been introduced in six impoundments in three states. Adult fish were used in two instances but no reproduction has been found. (Auth. abst.)

1951. Surber, Eugene W. 1958. RESULTS OF STRIPED BASS (ROCCUS SAXATILIS) INTRODUCTIONS INTO FRESHWATER IMPOUNDMENTS. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 273-276.

Attempts to establish self-sustaining fresh water populations have been unsuccessful for the most part. Meager evidence to date points to probable success of introductions into Kerr Reservoir (North Carolina-Virginia). Sufficient time has not elapsed since most of the other recent introductions to warrant evaluation.

1952. Copeland, J. B. 1958. EXPERIMENTAL USE OF EXPLOSIVES ON THE AUCILLA RIVER. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 277-280.

Seven charges of Nitromon Primer S were exploded at six stations on the Aucilla River. Results of three explosions, each consisting of ten pounds of explosive, at Station No. 1 killed at least 842 shortnose gar, 300 longnose gar and three channel catfish. The successive treatments at this station indicated a reduction of longnose gar in the area. More shortnose gar were destroyed in the third explosion than in the first and second.

Variation occurred in the results at other stations. It was noted gar concentrations could be detected by their surfacing activity. At all stations where this activity was noted, large numbers of gar were killed without destroying many fish of other species. At stations where this activity was not noted, frequently, numerous fish of other species were destroyed. (Auth. abst.)

1953. Lawrence, J. M. 1958. RECENT INVESTIGATIONS ON THE USE OF SODIUM ARSENITE AS AN ALGACIDE AND ITS EFFECTS ON FISH PRODUCTION IN PONDS. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 281-287.

The use of one or more applications of 4 ppm As_2O_3 as sodium arsenite will produce a fairly satisfactory control of Pithophora in a majority of fish ponds if applied while the alga is in an active growing stage. However, under certain conditions two applications of sodium arsenite at the above rate have failed to give satisfactory control of Pithophora and Hydrodictyon.

In experimental ponds two applications of 4 ppm sodium arsenite applied one month apart reduced the number of bottom organisms an average of 34 percent and reduced bluegill production an average of 42 percent as compared with those of the control ponds. Two applications of 8 ppm sodium arsenite, applied one month apart, reduced the number of bottom organisms an average of 45 percent and reduced bluegill production an average of 65 percent as compared with production in control ponds.

In later experiments where one application of 4 ppm sodium arsenite applied the following year to ponds that had the previous year received two applications at the 4 ppm rate, the average number of bottom organisms was 33 percent greater, but the bluegill production was an average of 17 percent less than in control ponds. An application of 4 ppm sodium arsenite to ponds that the previous year had received two applications of 8 ppm reduced the numbers of bottom organisms an average of 20 percent and reduced bluegill production an average of 25 percent. However, one pond in each of these tests had been drained and refilled only once and left dry for four months, and the other pond had been drained and refilled twice between the 1955 and 1956 tests. In each test the pond drained and refilled two times gave a higher bluegill production than did the ponds that were drained and refilled only once and left dry for four months between the tests.

In a number of lakes and ponds in Alabama that had been recently treated with sodium arsenite to control Pithophora, delayed bluegill reproduction as well as poor growth of young bass was observed during the early summer of 1956.

An application of 4 ppm sodium arsenite killed all of the microcrustacae and greatly reduced the population of rotifers. This absence of microcrustacae existed for almost two months in experimental ponds. This absence of food for small fish probably explains, at least in part, the reduced numbers and poor growth observed in numerous ponds which had been treated with sodium arsenite. (From auth. summ.)

1954. Cobb, Eugene S. 1958. EXPERIMENTS WITH YELLOW BASS (MORONE INTERRUPTA) IN TENNESSEE FARM PONDS. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 289-293.

These experiments, although limited, have demonstrated that yellow bass, under certain environmental conditions, are capable of living, growing, and reproducing in farm ponds. Additional information on productivity, population control, long term survival, and fishing success will be needed, however, before a satisfactory evaluation of the species can be made. The initial results would probably justify further experimentation. (Auth. conclusions)

1955. Dickson, Arthur W. 1958. THE STATUS OF STRIPED BASS (ROCCUS SAXATILIS) (WALBAUM) IN NORTH CAROLINA WATERS. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 264-268.

The biology of striped bass in North Carolina waters, management problems of the Roanoke River run, and attempts at establishing land-locked populations in several reservoirs are summarized.

1956. Barry, Edwin M. 1958. STRIPED BASS (ROCCUS SAXATILIS) (WALBAUM) RESEARCH IN MARYLAND. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 268-270.

A brief review of past research is given with a more detailed account of current studies concerned with spawning, areas of production, migration, evaluation of the 15-pound maximum size limit, and evaluation of net fishing on spawning areas. Five related investigations are listed; attempts at establishing fresh water populations are mentioned.

1957. Huish, Melvin T. 1958. FOOD HABITS OF THREE CENTRACHIDAE IN LAKE GEORGE, FLORIDA. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 293-302.

An investigation of the stomach contents of bluegill, black crappie, and redear sunfish was made from specimens collected during several months of 1948, 1949, and 1950, in Lake George, Florida. Major items found in stomachs of 432 large bluegills were: aquatic vegetation, crustacea, insects, and fish eggs. Fifty-five stomachs from small bluegills contained, principally, Cladocera and Diptera larvae. Dorosoma petenensis vanhyningi (Weed) was the major food organism found in 145 black crappie. An analysis of 69 redear sunfish stomachs showed snails (Amnicola sp.) were the dominant food of this species. (Auth. abst.)

1958. Gray, D. LeRoy. 1958. STRIPED BASS FOR ARKANSAS? Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 287-289.

Attempts, essentially unsuccessful, to obtain large numbers of striped bass from South Carolina waters are described. Both landlocked and sea run fish were obtained in small quantities. This experience has led to the conclusion that the only practical method of securing, transporting, and stocking striped bass in inland waters is by using fingerling fish.

1959. Huish, Melvin T. 1958. LIFE HISTORY OF THE BLACK CRAPPIE OF LAKES EUSTIS AND HARRIS, FLORIDA. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 302-312.

A study of the life history of the black crappie, Pomoxis nigromaculatus (LeSueur), from Lakes Eustis and Harris, Florida, was made in 1952 and 1953.

A comparison of the age composition of the individual and combined samples of 318 Lake Eustis and 403 Lake Harris black crappie showed a similarity existed between the two populations. The scale reading indicated few crappie reached the age-group VIII or older in Lake Eustis and few reached the age-group VII or older in Harris. Males and females showed only minor differences in growth. Calculations of growth from scale measurements yielded the following estimates of length at the end of the first eight years of life in Lake Eustis: first--2.0 inches; second--4.4 inches; third--6.8 inches; fourth--8.3 inches; fifth--9.4 inches; sixth--10.4 inches; seventh--11.2 inches; and eighth--11.7 inches. Results of calculations of crappie from Lake Harris were: first--1.9 inches; second--4.2 inches; third--6.6 inches; fourth--8.5 inches; fifth--9.8 inches; sixth--11.2 inches; seventh--12.2 inches; eighth--13.0 inches; and ninth--13.8 inches. A comparison of growth with other areas in the Southeast, indicated growth of Eustis and Harris crappie was slower and they lived longer.

An analysis of the length-frequency distribution of 1,888 fish from Lake Eustis and 3,521 from Lake Harris did not aid materially to substantiate age and growth calculations based on scale measurements. Selectivity of the net resulted in a pronounced bias.

The sex ratio varied during the months of study. It was found males were fewer than females during the period of examination. A similarity of sex ratios existed between crappie of the two lakes. Progression to spawning condition of both sexes was noted during the study in both lakes.

A comparison of average weight of catches per haul and temperature data indicated larger catches were made during the colder months.

Length-weight data of 1,471 black crappie from Lake Eustis and 2,118 from Lake Harris is presented. (Auth. abst.)

1960. Huish, Melvin T. 1958. GIZZARD SHAD REMOVAL IN DEER ISLAND LAKE, FLORIDA. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 312-318.

Results of four experiments on 5.5-acre Deer Island Lake demonstrated that selective poisoning was a practical method for reducing the gizzard shad population. Past haul seine efforts had effected only a temporary reduction in this lake.

A concentration of 0.04 ppm of 5 percent emulsified rotenone killed very few gizzard shad. A 0.1 ppm concentration resulted in a conservatively calculated kill of 4,651 pounds or 846 pounds per surface acre. An application of 0.15 ppm concentration killed larger shad as well as a few bass. A subsequent application of 0.1 ppm concentration produced a large unexplained kill of bass. (Auth. abst.)

1961. Berry, Frederick H. 1958. AGE AND GROWTH OF THE GIZZARD SHAD (DOROSOMA

LACEPEDI) (LESUER), IN LAKE NEWNAN, FLORIDA. Proceedings of the Eleventh Annual Conference, Southeastern Association of Game and Fish Commissioners, October 20-23, 1957, pp. 318-330.

Interpretation of scale structure and statistical analyses of collections indicated the following to be components of the life history of the gizzard shad in Lake Newnan, Florida. They average 10 inches in total length at the end of their first year of life, 12.5 inches at the end of the second year, and 13.6 inches at the end of the third year. They have a very short life span, only about 5 percent approaching their third actual year of life; none over four years old were found. The Lake Newnan shad grow faster (at least during the first actual year of life) and die younger than those reported from other, more northern areas. The female population has a more variable growth rate than that of the male. Before the end of their first actual year of life, males have grown slightly more than the females; and after this time the females grow faster. Males die at an earlier age than the females.

Spawning is concentrated in March and April and probably extends from February into May. A small portion of the population matures during the second calendar year of life, but the majority does not mature until its third calendar year. A concentrated mortality is associated with the later portion of the spawning period.

Peculiarities in scale markings were noted that had not been described in previous studies of gizzard shad scales from more northern waters. Prior to the formation of the first annulus, primary annulus-like growth rings developed on the scales, from 4 to 15 on fish 1.5 to 9 inches total length. The number formed was directly related to the size of the fish, and the size of the scale, and the positional relationships of these rings were relatively constant. An innate physiological action is suggested to be the cause of this formation, rather than an environmental influence. (Auth. abst.)

1962. Wilson, William D. 1957. PARASITES OF FISHES FROM LEAVENWORTH COUNTY STATE LAKE, KANSAS. Transactions of the Kansas Academy of Science, Vol. 60, pp. 393-399.

Sixty-two fish of 11 species were examined; of these, 66 percent had at least one species of parasite. Only six species of parasites were found. Posthodiplostomum minimum, sometimes called the white grub of the liver, was the most important parasite from the standpoint of incidence and degree of infection. Fish species examined and the parasites found are listed.

1963. Allan, I. R. H., D. W. M. Herbert, and J. S. Alabaster. 1958. A FIELD AND LABORATORY INVESTIGATION OF FISH IN A SEWAGE EFFLUENT. Ministry of Agriculture, Fisheries and Food Fishery Investigations, Series I, Vol. VI, No. 2, 76 pgs.

The population of fish in the area was studied by a trapping method. In the effluent channel, which was about one mile long and contained undiluted sewage effluent, large numbers of fish were caught in the summer but very few in the winter. Similar fluctuations in catches were observed in a control stream nearby. On some occasions fish suffered mortalities in the effluent channel.

Laboratory investigations were made to ascertain at what levels the various factors measured in the effluent (dissolved oxygen, pH, ammonia, temperature, carbon dioxide, synthetic detergent derivatives, and the salts of heavy metals) became toxic to rainbow trout and, in some cases, to some species of coarse fish found in the effluent channel. To test whether the results on toxicity obtained in the laboratory experiments held for similar conditions in the effluent, fish of various kinds were held captive in floating fish-cages there and their periods of survival observed while the chemical and physical conditions in the effluent were measured as often as possible.

The results obtained from the fish cage experiments showed good correspondence with what would have been expected from the laboratory work on oxygen and carbon dioxide, but ammonia appeared to be more toxic in the effluent than in laboratory tests. The evidence from the studies of the chemical conditions in the effluent, from the survival of fish in cages and from the laboratory studies all suggest that the toxic conditions which occurred in the effluent were due mainly to low concentrations of dissolved oxygen and that free carbon dioxide appreciably increased the sensitivity of fish to oxygen lack.

But for the presence of carbon dioxide which reduced the pH value of the effluent the concentrations of ammonia which were often present would have been toxic within a short period; the concentrations of metallic salts present were too low to kill fish rapidly when the oxygen concentration was high but probably increased the susceptibility of the fish to low oxygen concentrations. Synthetic detergent derivatives were not likely to have contributed to the toxicity to a significant degree.

The considerable numbers of fish in the effluent channel during the spring and summer months were present in spite of lethal conditions occurring sometimes in parts of the channel. On occasion the conditions brought about the deaths of fish or their passive removal from parts of the channel, but in this particular situation repopulation was possible from nearby unpolluted waters. (Auth. summ.)

1964. Rochford, D. 1958. TOTAL PHOSPHORUS AS A MEANS OF IDENTIFYING EAST AUSTRALIAN WATER MASSES. Deep-Sea Research, Vol. 5, pp. 89-110.

In this paper the degree of conservatism of total phosphorus in relation to water mass composition of East Australian waters was examined.

In oceanic waters down to about 1000 m it was found that total phosphorus was generally conserva-

tive within limits of about ± 2.5 µg/l. However, some of this variability could be due to errors in water mass identification and the degree of conservatism was probably better than these limits indicate.

In the slope and coastal waters of East Australia non-conservatism is general, with positive anomalies most frequent. It is suggested that these positive anomalies in coastal, slope, and oceanic waters were caused by the elevation and transport of phosphate rich bottom sediments. The probable factors involved in this phenomenon are discussed. (Auth. abst.)

1965. Cochrane, John D. 1958. THE FREQUENCY DISTRIBUTION OF WATER CHARACTERISTICS IN THE PACIFIC OCEAN. Deep-Sea Research, Vol. 5, pp. 111-127.

The bivariate distribution of water characteristics in the Pacific Ocean is studied using 155 hydrographic stations. Separate diagrams of potential temperature against salinity give the distributions for the North, the South, and the entire Pacific Ocean. The dominant feature in all the diagrams, an enormous mode near 1.5C, 34.7 per mille, results largely from water below 2000 m. The mode is at 1.75 C in the South Pacific distribution. It is stronger in the North Pacific distribution and lies at 1.25 C. This lower temperature is surprising, but apparently explicable. A mode at 4.5 C, 34.55 per mille, Tropical Water, is due mainly to water between the Tropics at depths from 700 m. to 1100 m. It is associated with a layer of minimum salinity extending through much of its region of occurrence. Two other waters characterized by extensive salinity minimum layers are represented by ridges in the distributions. These are identified and their relationships with Tropical Water discussed. Also discernible in the distributions are features representing the water of the thermocline layers above the salinity minimum layers. Surface layers account for most of the spreading of the distributions from the modes and important ridges. Unlike the Atlantic and Indian Oceans, the Pacific shows no modes which are far removed from the principal ones. Univariate distributions of characteristics are presented. Means and certain percentiles are tabulated. (Auth. abst.)

1966. Pollak, M. J. 1958. FREQUENCY DISTRIBUTION OF POTENTIAL TEMPERATURES AND SALINITIES IN THE INDIAN OCEAN. Deep-Sea Research, Vol. 5, pp. 128-133.

A correlation table of potential temperatures and salinities for the entire volume of the Indian Ocean is presented. Frequencies, in terms of $10^4 km^3$, are given for class intervals of 0.5° C x 0.1 per mille. Three classes, in the temperature range 0.5 to 2.0° C and salinity range 34.7 to 34.8 per mille, include 32 percent of the total volume. This group represents the core of the deep water of the Indian Ocean. In the central portion of the ocean, and in the Arabian Sea and Bay of Bengal, only very limited station data are available. Consequently, the correlation table represents a substantial amount of subjective interpolation. (Auth. abst.)

1967. Montgomery, R. B. 1958. WATER CHARACTERISTICS OF ATLANTIC OCEAN AND OF WORLD OCEAN. Deep-Sea Research, Vol. 5, pp. 134-148.

The volume of Atlantic Ocean water in each bivariate class with potential-temperature range of 0.5 C and salinity range of 0.1 per mille has been estimated from 105 uniformly distributed hydrographic stations. The resulting statistics are presented on a pair of characteristic diagrams, each having potential temperature and salinity as co-ordinates, potential specific-volume anomaly being represented by isopleths. Several water types stand out distinctly as separate modes. These statistics are then combined with Cochrane's for the Pacific Ocean and Pollak's for the Indian Ocean to form a pair of diagrams for the world ocean. These diagrams provide the first ocean-wide frequency distributions of water characteristics. It is found that the mean potential temperature is 3.52 C, the mean salinity is 34.72 per mille, and the mean potential specific-volume anomaly is 56 cl/ton; these values accord with the mean temperature and salinity estimated by Krummel in 1907. (Auth. abst.)

1968. Bogorov, B. G. 1958. BIOGEOGRAPHICAL REGIONS OF THE PLANKTON OF THE NORTH-WESTERN PACIFIC OCEAN AND THEIR INFLUENCE ON THE DEEP SEA. Deep-Sea Research, Vol. 5, pp. 149-161.

Biogeographical regions in the pelagial of the ocean can and should be characterized not only by their typical species but also by their production of plankton. The biomass of plankton (weight in mg per 1 m^3) in the boreal region of the North Pacific Ocean is about ten times greater than in its tropical region. Since plankton is the basis of all food-relationships through the whole thickness of the ocean water mass, this will tell also on the abundance of benthos and the character of bottom sediments. The boreal region is richer in benthic life and its sediments contain a greater amount of silica. (Auth. abst.)

1969. Ritchie, G. S. 1958. SOUNDING PROFILES BETWEEN FIJI, CHRISTMAS AND TAHITI ISLANDS. Deep-Sea Research, Vol. 5, pp. 162-168.

Three sounding profiles in the South West Pacific are described and an attempt made to classify the different types of terrain recorded by echo sounder. (Auth. abst.)

1970. Creager, Joe S. 1958. A CANYON-LIKE FEATURE IN THE BAY OF CAMPECHE. Deep-Sea Research, Vol. 5, pp. 169-172.

A previously unknown canyon bordering the Campeche Bank is described and delineated from new soundings obtained during a survey of the

Southern Gulf of Mexico conducted in February, 1957. (Auth. abst.)

1971. Schaefer, Milner B. 1957 A STUDY OF THE DYNAMICS OF THE FISHERY FOR YELLOWFIN TUNA IN THE EASTERN TROPICAL PACIFIC OCEAN. Inter-American Tropical Tuna Commission Bulletin, Vol. 11, No. 6, pp. 247-285.

For purposes of this study, the yellowfin tuna fishery off the west coast of the Americas, extending from Baja California to northern Peru is considered as a single, independent biological unit. The distinctness of this population has been evidenced by several studies, but whether the population within these limits is homogenous has not been demonstrated. This analysis is to this extent provisional.

The maximum average equilibrium catch may be expected to be obtained with about 35,000 standard days' fishing effort, and to be about 195 million pounds. This was approached in 1950, 1952, and 1953. Due to economic considerations, fishing effort decreased markedly in 1954 and 1955. Data for 1956 so far indicate that the maximum average will not have been attained.

It would appear that the current level of fishing effort is somewhat below that corresponding to maximum average equilibrium catch and is likely to remain so in the near future. Observations of fishing effort and catch at levels higher than those yet observed are needed to verify validity of extrapolations made beyond the range of data on hand.

The mathematical model, its implicit assumptions, and parameter estimation are described. (Auth. abst.)

1972. Moulton, James M. 1958. THE ACOUSTICAL BEHAVIOR OF SOME FISHES IN THE BIMINI AREA. The Biological Bulletin, Vol. 114, No. 3, pp. 357-374.

On the basis of observations and recordings at sea and in the laboratory, the acoustical behavior of 13 species of Bahamian fishes is described, and their sounds are defined. Twenty-six species producing no calls in the course of this study are specified.

The most important sound-producers among fishes of the Bimini area are the squirrelfish, Holocentrus ascensionis, and the Nassau grouper, Epinephalus striatus. Their characteristic sounds may be anticipated when these species encounter a strange object at sea, and probably generally during the daytime along the edges of the Great Bahama Bank. A single observation has indicated that calling is a component of recognition behavior in the black angelfish, Pomacanthus arcuatus. The families Chaetodontidae and Holocentridae should be added to lists of fish families containing calling members.

The usefulness of underwater listening in studying the distribution of some calling fishes has been demonstrated in the cases of the squirrelfish and Nassau grouper. (Auth. summ.)

1973. Boroughs, Howard, and Della F. Reid. 1958. THE ROLE OF THE BLOOD IN THE TRANSPORTATION OF STRONTIUM^{90}-YTTRIUM^{90} IN TELEOST FISH. The Biological Bulletin, Vol. 115, No. 1, pp. 64-73.

Blood, easily removed without clotting from the heart or kidney sinus of fishes if the fish are handled gently and their opercula are kept immersed, has a uniform number of red blood cells/mm^3. The mixing time of Sr^{90}-Y^{90} injected in the ventricle of Tilapia mossambica is approximately 30 minutes.

Sr^{90}-Y^{90} rapidly disappears from the blood. At 24 hours, only between 0.8 and 1.6 percent of the injected dose remains in the blood. The disappearance of radioactivity from the blood depends on more than a single process. Almost all of the Sr^{90} in whole blood is carried by the plasma. Very little Sr^{90} is found either in the cells or on the cell walls. Yttrium^{90}, on the other hand, is present in the stroma.

The pattern of internal distribution of intravascularly injected Sr^{90}-Y^{90} is the same as that which was found for either intramuscular or oral administration in the same species. Vascularized tissues have a greater avidity for Y^{90} than they have for Sr^{90}. (Auth. summ.)

1974. Sundararaj, B. I. 1958. THE SEMINAL VESICLES AND THEIR SEASONAL CHANGES IN THE INDIAN CATFISH, HETEROPNEUSTES. Copeia, 1958, No. 4, pp. 289-297.

Heteropneustes fossilis has well developed seminal vesicles which are specialized lobes of the testes. They do not act as storage for the sperms, excepting a small quantity noticed at the place where the seminal vesicles communicate with the testis, but do secrete a vesicular fluid, the actual function of which is not known.

The seminal vesicles exhibit seasonal changes which closely correspond with that of testes. They increase in size during the prespawning period and attain the maximum size during the spawning period. The fluid is probably expelled mainly as a constituent of milt during spawning. The vesicles start regression during the postspawning period and become almost indistinguishable from the lobes of the testes during the preparatory period. (Auth. summ.)

1975. Hubbs, Carl L., and Clark Hubbs. 1958. NOTROPIS SALADONIS A NEW CYPRINID FISH ENDEMIC IN THE RIO SALADO OF NORTHEASTERN MEXICO. Copeia, 1958, No. 4, pp. 297-307.

A taxonomic description of this small minnow.

1976. Legault, Romeo. 1958. THE EARLY LIFE HISTORY OF TWO CYPRINIDS, NOTROPIS RUBELLUS AND CAMPOSTOMA ANOMALUS PULLUM. Copeia, 1958, No. 4, pp. 325-330.

Development from fertilization (artificial) through larval stages for both species is described.

1977. Crawford, Ronald W. 1958. BEHAVIOR, GROWTH AND MORTALITY IN THE BLUEGILL, LEPOMIS MACROCHIRUS RAFINESQUE, FOLLOW-

ING FIN CLIPPING. Copeia, 1958, No. 4, pp. 330-331.

Results from two studies, one lasting eight weeks, the other one year, clearly demonstrated that if competition is at a minimum and food is plentiful, growth is rapid. But if competition is at a maximum and food is scarce, growth is very slow if any at all occurs. Behavior of fish following fin clipping is described. Pectoral and caudal fins were clipped in both studies.

1978. Phillips, Craig. 1958. AN UNUSUALLY COLORED GARFISH, LEPISOSTEUS PLATYRHINCUS. Copeia, 1958, No. 4, p. 331.

This specimen had a bright orange color above, shading to orange-yellow on the lower sides and venter, and jet black eyes.

1979. Wilson, John N. 1958. THE LIMNOLOGY OF CERTAIN PRAIRIE LAKES IN MINNESOTA. The American Midland Naturalist, Vol. 59, No. 2, pp. 418-437.

Four prairie lakes of southwestern Minnesota were studied in 1937-38 to determine some factors of fertility and biological productivity based on their standing crops of plankton and bottom fauna. Subsequent information has been provided on the more recent status of the lakes from the standpoint of physico-chemical factors of fertility and fish populations.

The lakes lie in till plain depressions between moraines of the late Wisconsin glacier. Lakes Shetek and Heron have both inlet and outlet, even during extreme drought, but Dead Coon and Kandiyohi are landlocked except at high water levels. There is little tendency for chemical and thermal stratification except in winter under the ice. The extreme shallowness of the lakes provides for "close superposition of the photosynthetic zone over the decomposition zone" throughout their entire basins as contrasted to the limitation of this condition to littoral areas as with deeper lakes. When this condition is combined with turbulence which mixes the water mass thoroughly, allowing all photoplankters the same average conditions of light, the stage is set for a high level of productivity. "Freezing-out" or depletion of dissolved oxygen beneath the ice in winter was a common occurrence in all of the lakes except Shetek during the drought years. More recently, Heron is the only lake which "freezes-out" regularly each winter.

Bottom fauna was most abundant in Heron Lake and sparest in Shetek. This is attributed to the small population of fish in Heron owing to drought winterkills in contrast to the large population of carp and other rough fish in Shetek which had been grazing on the bottom and consuming the fauna.

The lakes have been classified in three ways: (a) advanced eutrophic according to Naumann and Thienemann, (b) temperate lakes of the third order according to Forel and Whipple, and (c) Heron and Dead Coon as "bullhead lakes" and Shetek and Kandiyohi as "bass-pan fish-walleye lakes according to Eddy. (From auth. summ.)

1980. Brown, Jerram L. 1958. GEOGRAPHIC VARIATION IN SOUTHEASTERN POPULATIONS OF THE CYPRINODONT FISH FUNDULUS NOTTI (AGASSIZ). The American Midland Naturalist, Vol. 59, No. 2, pp. 477-488.

This paper is primarily a study of the geographic variation in coastal plain populations of Fundulus notti from southern Virginia to Louisiana. For comparison, a small sample of the subspecies found in the Upper Mississippi River system (dispar) has also been included.

1981. Jackson, Daniel F. and Wilford A. Dence. 1958. PRIMARY PRODUCTIVITY IN A DICHOTHERMIC LAKE. The American Midland Naturalist, Vol. 59, No. 2, pp. 511-517.

A dichothermic lake near Syracuse, New York, is described and investigation of its characteristics presented. Planktonic algae are almost nonexistent whereas zooplankton are abundant. It has been suggested that the food source for the latter is the purple bacteria found in quantity at the 75-foot level in the lake. Experiment indicates that some factor is either lacking or is proscriptive for the growth of planktonic algae. (Auth. summ.)

1982. Mullan, James W. 1958. THE SEA-RUN OR "SALTER" BROOK TROUT (SALVELINUS FONTINALIS) FISHERY OF THE COASTAL STREAMS OF CAPE COD, MASSACHUSETTS. Bulletin Number 17, Massachusetts Division of Fisheries and Game, 25 pgs.

This fishery was studied by determining the migration, harvest, and growth of 92, 100 marked brook trout stocked in 5 coastal streams over a period of 8 years. It was found that marine movement was most pronounced between streams draining the same estuarine environment, that returns of stocked fish (40%) were judged fair to good by Massachusetts standards, that the sea-run trout were generally larger than other trout caught, that growth of hatchery trout paralleled native trout, and that the total fishery had declined over the years because of the loss of fresh-water habitat.

To preserve this unique fishery, stocking, preservation, and improvement of existing suitable streams is recommended and well worth the effort. Brook trout, to the exclusion of brown and rainbow trout, should be stocked in most cases.

1983. Thomson, J. A. 1958. BIOLOGICAL EFFECTS OF THE RIPPLE ROCK EXPLOSION. Progress Reports of the Pacific Coast Stations, Fisheries Research Board of Canada, No. 111, pp. 3-8.

Ripple Rock, long a serious hazard to navigation in Seymour Narrows, was removed by driving a 2500-foot tunnel from Maud Island, under the narrows, terminating in a series of passages within the peaks. These passages were filled with 2, 750, 000 lb. of explosive.

Recoveries of fish placed in cages prior to the detonation indicate that fish mortality due to the Ripple Rock blast was confined to an area less than

half a mile in radius from the rock. Even though dead rockfish were recovered off Separation Head (2 1/2 miles distant), these fish were presumably killed closer to the rock and swept northward by the tide. Considering that lingcod placed in traps half a mile from the blast survived in spite of confinement and previous handling, and that observed mortality directly attributable to the blast was confined to rockfish, it is concluded that damage to the fish population of Discovery Passage was negligible.

1984. Wickett, W. Percy. 1958. ADULT RETURNS OF PINK SALMON FROM THE 1954 FRASER RIVER PLANTING. Progress Reports of the Pacific Coast Stations, Fisheries Research Board of Canada, No. 111, pp. 18-19.

During even-numbered years, almost no pink salmon enter the Fraser River system. To determine how many fish would return to a small tributary, a hundred miles inland, when other members of their species were not present to minimize losses to predators, 1, 100, 000 fry of moderate size were stocked in 1954 in Jones Creek.

In 1956, approximately 4500 adults reached the Fraser River. Between 2, 581 and 3, 024 spawned in Jones Creek; the others were taken in the fisheries.

Homing of a very high degree was shown by the fact that 9 of 12 salmon tagged above Jones Creek were subsequently recovered in Jones Creek. In view of the low flow (10 cfs) of Jones Creek compared to the many tens of thousands of cubic feet flow of the Fraser, this is quite remarkable.

Returns were quite low, 0. 3 percent of fry stocked, compared to returns from stockings during odd-numbered years.

This single experiment indicates that the population of each spawning stream can not be treated separately, that a certain minimum population must be maintained for the whole watershed.

1985. Oehmcke, Arthur A., Leon Johnson, John Klingbiel, and Clarence Wistrom. 1958. THE WISCONSIN MUSKELLUNGE, ITS LIFE HISTORY, ECOLOGY, AND MANAGEMENT. Publication 225, Wisconsin Conservation Department, 12 pgs.

Classification, distribution, description, habits and habitat, reproduction, growth, population size, ecology, angling, economic value, and management of the Wisconsin muskellunge are covered.

1986. Brasch, John , James McFadden, and Stanley Kmiotek. 1958. THE EASTERN BROOK TROUT, ITS LIFE HISTORY, ECOLOGY, AND MANAGEMENT. Publication 226, Wicsonsin Conservation Department, 11 pgs.

The classification, distribution, description, habits and habitat, reproduction, growth and longevity, population size, ecology, angling and other harvest, and management of the brook trout are covered with particular reference to Wisconsin waters.

1987. Beadle, L. C. 1958. CLASSIFICATION OF BRACKISH AND INLAND SALINE WATERS. Nature, Vol. 182, No. 4627, pp. 27-28.

At a conference held during April 8-14, 1958 at Venice under the joint auspices of the International Association of Limnology and the International Union of Biological Sciences, the following basic scheme for classification was proposed:

Zone	Salinity-range (o/oo)
Hyperhaline	greater than about 40
Euhaline	about 40 to about 30
Mixohaline	(about 40) about 30 to about 0. 5
Mixoeuhaline	greater than about 30 but less than adjacent euhaline sea
(Mixo) polyhaline	about 30 to about 18
(Mixo) mesohaline	about 18 to about 5
(Mixo) oligohaline	about 5 to about 0. 5
Limnetic (freshwater)	less than about 0. 5

1988. Bardach, John E. 1958. ON THE MOVEMENTS OF CERTAIN BERMUDA REEF FISHES. Ecology, Vol. 39, No. 1, pp. 139-146.

Reef fishes of several species occurring in Bermuda waters were tagged and recaptured repeatedly. Underwater observations of their behavior were also made. The tagging and study area was located among several isolated reefs to the north of Bermuda. It was found that only some individuals of several species of serranids remain in the same area for over a year. Many red hinds (Epinephelus guttatus) and Nassau groupers (E. striatus) move freely from reef to reef during a twelve month period. However, when fish of these same species were transplanted from one reef to another, several hundred feet away, and observed over a period of two months, most individuals were found to return to the reef on which they were originally tagged.

The smaller and partly herbivorous green angelfish (Holacanthus bermudensis), surgeon fish (Acanthurus spp.) and several species of pomacentrids were found to be more restricted in their movements than the larger carnivores and it is probable that they spend their entire life cycles in a small reef area. Failure to return to an original tagging location when transplanted appeared to go hand in hand with the small ranges of these species.

Additional observations on habits and movements of several other reef species are also given. (Auth. summ.)

1989. Whittaker, R. H., and C. Warren Fairbanks. 1958. A STUDY OF PLANKTON COPEPOD COMMUNITIES IN THE COLUMBIA BASIN, SOUTHEASTERN WASHINGTON. Ecology, Vol. 39, No. 1, pp. 46-65.

The channeled scablands of the Columbia Basin contain numerous lakes and ponds; and many of these, in the semi-arid climate, are saline. Forty water bodies ranging from fresh to highly saline and from true lakes to temporary ponds were selected for study of plankton copepod communities.

Population samples of shore and open-water plankton were mounted on slides in polyvinyl alcohol, and adult copepods were tallied by species. The population data made possible an approach which was not simply faunistic, but an experiment in plankton synecology or biocenotics.

Relations of species to the salinity gradient were investigated. In lakes Diapotomus ashlandi and Epischura nevadenis were characteristic of oligotrophic conditions, Cyclops bicuspidatus and D. novamexicanus of eutrophic fresh to mildly saline conditions, and D. sicilis of moderately saline conditions. Pond species were less clearly segregated by salinity and more strongly affected by seasonal instability and other factors. Attempts to establish effects of various metallic ions on species populations and plankton community-types gave inconclusive but generally negative results.

Although the area contains deep, rock-walled, oligotrophic lakes, the majority of the water bodies are shallow and eutrophic. Productivity, as expressed in microcrustacean standing crops, increased with increasing salinity in both lakes and ponds through most of the range of salinity conditions sampled. Microcrustacean populations per unit volume of water were almost twice as high in ponds as in lakes, but were low in most of the temporary ponds.

A matrix and plexus for plankton samples and community-types were prepared by measurements of percentage similarities; six community types which could be characterized by copepod populations and limnological conditions resulted. Percentage co-occurrences were used to prepare a matrix and plexus of distributional relations of species. Both treatments suggest a central complex of community-types and species characteristic of eutrophic, fresh to mildly saline, relatively stable water bodies, and community-types and species which depart from these in three directions of environmental extremity--oligotrophy, salinity, and seasonal instability.

Distributional relations of copepod species are summarized. Copepods are excluded from water bodies of high salinities; these are characterized by dense populations of single crustacean species (Moina hutchinsoni at 38, 700 ppm in Soap Lake, Artemia salina in still more saline bodies). (Auth. summ.)

1990. Kobayashi, Shinjiro, and Matahei Mogami. 1958. EFFECTS OF X-IRRADIATION UPON RAINBOW TROUT (SALMO IRIDEUS). III. OVARY GROWTH IN THE STAGES OF FRY AND FINGERLING. Bulletin of the Faculty of Fisheries, Hokkaido University, Vol. 9, No. 2, pp. 89-94.

The growth of the ovary of the rainbow trout fry exposed to the X-ray of 100r and 500r was compared with that of the control.

The low and effective dosage of X-ray on the ovary of the rainbow trout in the stages of fry and fingerling is between 100r and 500r. The relative weight of the ovary in the 100r group attains the control level by the period from the 166th to the 209th day after irradiation. But, in the 500r group significant lowering is found to remain even in the period from the 273rd to the 315th day.

In the seasons of the autumn and winter no increase of the ovary length is found in proportion to that of the body length. During such a period the effect of X-irradiation upon the relative length of the ovary does not stand out distinctly, but a highly significant difference in that respect between the 500r and each of the control and 100r groups is found in the later period from spring to early summer. (Auth. summ.)

1991. Bainbridge, Richard, and R. H. J. Brown. 1958. AN APPARATUS FOR THE STUDY OF THE LOCOMOTION OF FISH. The Journal of Experimental Biology, Vol. 35, No. 1, pp. 134-137.

This consists of a 7-foot 6-inch diameter water-filled rim of a wheel which rotates about its vertical axis. Three radial plates, which can be withdrawn into pockets along the inner wall of the rim are so operated as to have at least one plate closed at all times thus forcing the constrained water to move at the same speed as the wheel. The wheel is rotated at the same speed as the fish, but in the opposite direction. Additional details are provided.

1992. Bainbridge, Richard. 1958. THE SPEED OF SWIMMING OF FISH AS RELATED TO SIZE AND TO THE FREQUENCY AND AMPLITUDE OF THE TAIL BEAT. The Journal of Experimental Biology, Vol. 35, No. 1, pp. 109-133.

An apparatus is described in which it is possible to study and record the continuous swimming of fish at speeds up to 20 m.p.h. Records made of the swimming at different speeds of dace, trout and goldfish measuring up to 30 cm. in length are reproduced.

Speed at any particular frequency of tail beat is shown to be directly related to the length of the specimen, measured from the tip of the snout to the most posterior extremity of the tail. Above a frequency of 5 tail beats per second speed is directly dependent upon frequency up to the maximum values recorded. The results for all sizes and species recorded may be adequately expressed by the formula $V=1/4\ \{L(3f-4)\}$, where V is the speed in cm. per sec., f is the frequency in beats per sec. and L is the body length in cm. The distance travelled per beat (and hence the speed) is directly dependent upon the amplitude of the tail beat.

The amplitude increases with increasing frequency up to a maximum reached at about 5 beats per second. This maximum amplitude is the same for all fish tested and is about one-fifth of the body length.

The maximum frequency attainable decreases with increasing size of the specimen. This decrease is slight in the trout and more pronounced in the dace and goldfish. Estimation of the possible maximum frequencies of much bigger fish allows for prediction of the maximum speeds they may be able to attain. Such predicted speeds are in accord with the measurements that have been made and are of the order of 10 body lengths per second up to a size

of 1 meter. (Auth. summ.)

1993. Mills, Harlow B., et al. 1958. A CENTURY OF BIOLOGICAL RESEARCH. Illinois Natural History Survey Bulletin, Vol. 27, Art. 2, pgs. 234.

One hundred years of the scientific progress of the Illinois State Natural History Survey are re viewed.

1994. Hamon, B. V. 1956. A PORTABLE TEMPERATURE-CHLORINITY BRIDGE FOR ESTUARINE INVESTIGATIONS AND SEA WATER ANALYSIS. Jour. Sci. Instruments, Vol. 33, No. 9, pp. 329-333; Biol. Absts., Vol. 32, No. 7, Abst. No. 21838. 1958.

An instrument for the measurement of temperature and chlorinity of water in situ is described. A thermistor is used for temperature measurement, and an electrical conductivity cell, the temperature coefficient of which is compensated by means of the thermistor, is used for chlorinity. The instrument is direct reading, with ranges of 0-30°C for temperature and 0-16 ppt (parts per thousand) and 16-20 ppt for chlorinity. The accuracy is $\pm$ 0.1°C for temperature, and $\pm$ 0.05 ppt for chlorinity on the higher range. When used in the laboratory as a transfer instrument, an accuracy of $\pm$ 0.02 ppt in chlorinity can be obtained. (Auth. summ.)

1995. Alekseev, N. K. 1955. ON THE SETTLEMENT OF CHIRONOMID LARVAE THROUGHOUT PONDS. (O RASSELENII LICHINOK KHIRONOMID PO VODOEMU.) Voprosy Ikhtiol, Vol. 5, pp. 145-149. Biol. Absts., Vol. 32, No. 7, Abst. No. 22128. 1958.

Three successive periods in the settlement of chironomid larvae in ponds are indicated. The 1st period is one of passive planktonic settlement; young larvae (of developmental states I and, in part, II), due to small size and positive phototaxis, accomplish natatorial motions, hovering in the water mass and spreading around ponds by currents and convectional flow; at the end of the period, alternation of natatorial motions with a resting state are observed, with concomitant submersion of larvae. The 2d is the phytophilic period: positive phototaxis diminishes, resting state of larvae becomes continuous; larvae settle on live or dead vegetation, preserving the ability to come to the surface. In the 3d period, larvae of various ecologic groups occupy habitational sites peculiar to them. Regularity of passage, by larvae of chironomids in their growth, through natatorial planktonic stage permits one to consider them as a food object of young of various fish during their transition to nutrition with plankton.

1996. Bokova, E. N. 1955. FOOD POSSIBILITIES OF THE YOUNG SEA OF AZOV HERRING IN CONDITIONS OF IRREGULAR FLOW. (PISHCHEVYE VOZMOSHNOSTI MOLODI TYUL'KI AZOVSKOGO MORYA V USLOVIYAKH ZAREGULIROVANNOGO STOKA. Voprosy Ikhtiol, Vol. 4, pp. 137-158; Biol. Abst., Vol. 32, No. 7, Abst. No. 22131. 1958.

In 1950 and 1951, nutrition of Black Sea herring (Clupeonella d. delicatula) was studied in all stages of development. To each stage in development of this species there correspond definite conditions of habitation and a definite complex of planktonic food items, availability of which is determined by morphologic features of species in the benthic stage. Young herring are characterized by great nutritional plasticity. Food spectrum is to a large degree dependent on the composition of the food base and adequacy of individual components. General index of the filling of intestines in a specific year fluctuates in relation to composition of food base (in 1949--153.0; in 1950--94.2; in 1951--81.3). Lower index in 1950 was related to deficiency of Rotifera in Taganrog Gulf, which was reflected in yield and tempo of growth of young herring, which was lower than in the years 1948-1949. Salinification of Taganrog Gulf as a consequence of irregular flow of the Don River does not produce substantial alteration in food composition of herring. Hence instead of fresh-water forms which are driven out (Rotifera and Cladocera), marine forms may make their appearance; the basic component of the food of young herring (Calanipeda aquaedulcis) remains in the Gulf. Disappearance of Rotifera may produce a decrease in reserves of herring or a slowing of its growth.

1997. Fryer, G. 1957. THE FEEDING MECHANISM OF SOME FRESHWATER CYCLOPOID COPEPODS. Proc. Zool. Soc. London, Vol. 129, No. 1, pp. 1-25; Biol. Absts., Vol. 32, No. 7, Abst. No. 22137. 1958.

Chance encounter appears to play an important part in finding food in both carnivorous and herbivorous species, but chemoreceptor organs apparently utilized by herbivores to discriminate between edible and inedible particles may help in seeking food. Structure, arrangement, and method of operation of various mouth parts are described, and raptatory method of feeding is demonstrated. The route taken by cyclopoids towards a parasitic mode of life is considered from a functional standpoint. Phylogeny of Cyclopoida and Calanoida is discussed. A carnivorous diet is considered to be the primitive diet of Cyclopoida. A change from a carnivorous to an algal diet may have been of considerable importance in adaptive radiation of the group. (Auth. summ.)

1998. Leveque, R. 1957. NOTES ON THE ICHTHYOLOGY OF CAMARGUE, RHONE DELTA. (NOTES SUR LA FAUNE ICHTYOLOGIE DE CAMARGUE.) Terre et Vie, Vol. 104, Nos. 2 and 3, pp. 231-240; Biol. Absts., Vol. 32, No. 7, Abst. No. 22145. 1958.

Deals with complex areas of rivers, canals, ponds, marshes' estuaries periodically opened to sea, and salt evaporation ponds. List of 34 species in 17 families with notes on distribution, salinity

tolerance, predators and general abundance of each fish. (R. M. C.)

1999. Matveeva, R. P. 1955. THE NUTRITION OF THE YOUNG PIKE IN THE SPAWNING-CULTIVATION ESTABLISHMENT IN 1953. (PITANIE MOLODI SUDAKA V NEROSTOVO-VYROSTNOM KHOZYAISTVE V 1953.) Voprosy Ikhtiol, Vol. 5, pp. 61-70; Biol. Absts., Vol. 32, No. 7, Abst. No. 22146. 1958. (Translation)

Four hundred and eight stomachs of young pike from "Kolyshnyi" spawning-cultivation establishment (Volga delta) were processed. In its development the young fish goes through 4 alimentary stages. In juvenile stage (5.5-13 mm) milt feeds on copepods and Cladocera, and to a lesser extent on larvae of fish. In the stage of miscellaneous nutrition (length of 24-34 mm) fish feed chiefly on assorted young fishes; plankton is of secondary importance. The 4th stage is that of carnivorous nutrition (length over 34 mm). Data are cited on composition of food of pikes of various dimensions, expressed in percentage of weight (recovered) and in percentage of frequency of occurrence. Index of intestinal filling, correlated with dimensions of pike and its victims and on daily variation in nutrition are also used. Young pike do not feed at night.

2000. Sycheva, A. V. 1955. ON THE DAILY VARIATION OF NUTRITION IN THE PELED COREGONUS PELED (GMELIN). (O SUTOCHNOM KHODE PITANIYA PELYADI COREGONUS PELED (GMELIN). Voprosy Ikhtiol. 1955(4), pp. 173-177; Biol. Absts., Vol. 32, No. 7, Abstract No. 22154. 1958. (Translation)

Daily variation of nutrition was studied in the peled in Lake Vymsky in the Turukhan River Basin (a tributary of Yenisei R.). Samples were obtained at 6, 12, 18, and 24 hours. Changes in composition of food of the peled over a 24-hour period were expressed in indices of overall intestinal filling with planktonic and benthic organisms and in percentage frequency of occurrence of individual components. Two periods of intensified nutrition were apparent: in morning and evening hours. At 6-18 hours plankton constituted from 67.4 to 80% of the weight of food of the peled; in the evening and at the beginning of night fish come to the surface, and they feed on larvae of coastal insects.

2001. Jayaraman, R., and S. S. Gogate. 1957. SALINITY AND TEMPERATURE VARIATIONS IN THE SURFACE WATERS OF THE ARABIAN SEA OFF THE BOMBAY AND SAURASHTRA COASTS. Proc. Indian Acad. Sci. Sect. B., Vol. 45, No. 4, pp. 151-164; Biol. Absts., Vol. 32, No. 7, Abst. No. 22213. 1958.

The distribution of surface temperature and salinity in the waters of the Arabian Sea along the Bombay and Saurashtra coasts is presented and discussed. The two factors show seasonal trends associated with the prevalence of the 2 monsoons, southwest and northeast. In general, waters north of 20°N. latitude have a higher salinity and lower temperature than waters south of it. The variations in salinity and temperature indicate the possibility of seasonal upwelling in the coastal waters between 20° and 21°N. latitude and to a less extent up to 22°N. latitude during the period December to February. It is suggested that these mixing phenomena may be of great importance in determining the fertility of these waters. (Auth. summ.)

2002. Margalef, R. 1957. PHYTOPLANKTON OF THE COASTS OF BLANES (GERONA), FROM AUGUST 1952 TO JUNE 1956. (FITOPLANCTON DE LAS COSTAS DE BLANES (GERONA) DE AGOSTO DE 1952 A JUNIO DE 1956. Invest. Pesq., Vol. 8, pp. 89-94; Biol. Absts., Vol. 32, No. 7, Abst. No. 22220. 1958.

A list of over 200 species of phytoplankton and tintinnoinea and their distribution in 75 superficial net collections is given. In general species are well known in the area. Dinoflagellates with extremely heavy membranes have been observed sometimes in spring. As compared with more southern localities of the same coast, annual sequence of populations shows a heavy second bloom of diatoms in May-June. (R. M.)

2003. Margalef, Ramón. 1957. LOCAL AND INTERANNUAL VARIATIONS IN THE SEQUENCE OF POPULATIONS OF NET PHYTOPLANKTON IN THE SURFACE WATERS ALONG THE SPANISH MEDITERRANEAN COAST. (VARIACIÓN LOCAL E INTERANUAL EN LA SECUENCIA DE LAS POBLACIONES DE FITOPLANCTON DE RED EN LAS AGUAS SUPERFICIALES DE LA COSTA MEDITERRÁNEA ESPAÑOLA. Invest. Pesq., Vol. 9, pp. 65-95; Biol. Absts., Vol. 32, No. 7, Abst. No. 22221. 1958.

A consideration of published data, covering from 1950 to 1956 in Blanes (lat. 41° 40' N.) and Castellón (40°N.) in the Western Mediterranean. For the most important species, representing about the 90% of the net phytoplankton, the successive yearly cycles have been tabulated. Every cycle from minimum biomass to next minimum can be characterized by 2 numbers; the 1 is the total successive monthly means along the cycle, the other is a reference to time, a "gravity center" of the distribution (t), obtained as follows: If 1, 2, 3... are the successive months and a, b, c... the abundances in the same months, then $t = \frac{1a+2b+3c+..}{a+b+c..}$

Species can be grouped in a number of groups, after certain ecological affinities, displayed in the parallelism of their interannual variations. Every group seems to have an optimum time around which production is maximized. Advection is sometimes obvious, but sequence can not always be attributed with certainty to advection or to true succession. Production of phytoplankton is higher in Castellón than in Blanes. The average cycle for Castellón shows a peak in February-March and a secondary (alloctonous) peak in May. In Blanes there are peaks in November and May, both of similar im-

portance. Advancement or retardation of whole groups of species and presence of certain species with indicator value characterize the years of good production. Interannual variations in Blanes are erratic; in Castellón there has been a steady trend towards an increased similarity with Blanes, that is, with more oceanic influence. The general differences between the cycles in Blanes and in Castellón are explained by the different distribution of winds that induce upwelling in relation to coastal features. This assumption is supported by other occasional data from Vinaroz, Málaga and Palma de Mallorca. Local differences in the cycles of phytoplankton may be operative in segregating populations of plankton feeding animals. (R. M.)

2004. De Angelis, Costanzo M. 1957. PHYSICO-CHEMICAL RESEARCH AND BIOLOGY OF BRACKISH PONTINE LAKES IN RELATION TO THEIR PRODUCTIVITY. I. THE LAKE OF FOGLIANO. (C). OBSERVATIONS ON THE SEASONAL CYCLE OF PLANKTON. (RICERCHE FISICO-CHIMICHE E BIOLOGICHE SUI LAGHI SALMASTRI PONTINI IN RELAZIONE ALLA PRODUTTIVITA. I. IL LAGO DI FOGLIANO. C) OSSERVAZIONI SUL CICLO STAGIONALE DEL PLANCTON.) Boll.Pesca, Piscicolt. e Idrobiol. Vol. 11, No. 2, pp. 225-234; Bilo. Absts., Vol. 32, No. 7, Abst. No. 22227. 1958.

The seasonal cycle of plankton in the lake of Fogliano is described in relation with salinity and with special attention to dominant species. (From auth. summ.)

2005. Jenkins, S. H. 1957. THE TREATMENT OF ORGANIC TRADE WASTES. Schweiz. Zeitschr. Hydrol., Vol. 19, No. 1, pp. 496-514; Biol. Absts., Vol. 32, No. 7, Abst. No. 22231. 1958.

Industrial organic wastes are of 4 main types, from the point of view of the methods of treating them: (1) fermentable or biologically oxidizable organic matter in solution, (2) soluble organic matter difficult to oxidize, (3)colloidally dispersed, or emulsified, organic matter, (4) suspended organic matter. General methods used in treatment of wastes from particular industries are discussed briefly. (C. C. D.)

2006. Mercier, P. 1957. NATURAL AND ARTIFICIAL AERATION OF LAKES. (L'AERATION NATURELLE ET ARTIFICIELLE DES LACS. Schweitz. Zeitschr. Hydrol., Vol. 19, No. 2, pp. 613-623; Biol. Absts., Vol. 32, No. 7, Abst. No. 22234. 1958.

Natural aeration of lakes is reviewed, and the difficulties of natural aeration in eutrophic lakes is discussed. The successful artificial aeration of Lac de Bret is described. In this lake the hypolimnion had become devoid of O_2 and soluble Fe during summer months, and was damaging the domestic water supply being taken from the lake. An artificial aeration station was established. At this station, water was removed from the hypolimnion. It was oxygenated and much of the CO_2 was removed by pulverization, after which it was returned (at the original temperature) to the hypolimnion. A great improvement in the quality of the lake resulted from the aeration. The author presents a plan for a similar aeration of the hypolimnion of Lac de Morat. This lake has about 116 times the volume of Lac de Bret. The plan calls for 2 aeration stations, 1 on the north shore of the lake, and 1 opposite on the south shore. Aeration will be brought about in the same manner as in Lac de Bret. The need for a simultaneous attack upon pollution is stressed, but it is thought that the aeration will help ameliorate the extreme eutrophic conditions that prevail. (C. C. D.)

2007. Milo di Villagrazia, Pietro. 1957. PHYSICO-CHEMICAL RESEARCH AND BIOLOGY OF BRACKISH PONTINE LAKES IN RELATION TO THEIR PRODUCTIVITY. I. THE LAKE OF FOGLIANO. A. HYDROGRAPHY AND PHYSICO-CHEMICAL CONDITIONS. (RICERCHE FISICO-CHIMICHE E BIOLOGICHE SUI LAGHI SALMASTRI PONTINI IN RELAZIONE ALLA PRODUTTIVITA. I. IL LAGO DI FOGLIANO. A) IDROGRAFIA E CONDIZIONI FISICO-CHIMICHE. Boll. Pesca, Piscicolt. e Idrobiol., Vol. 11, No. 2, pp. 165-186. Biol. Absts., Vol. 32, No. 7, Abst. No. 22235. 1958.

Results are reported of monthly observations on temperature, salinity, and oxygen content made in the lake of Fogliano since 1935. There is great variation owing to the irregular supply of fresh water and the inflow of salt water. (M. G.)

2008. Sheets, W. D., and G. W. Malaney. 1956. SYNTHETIC DETERGENTS AND THE BOD TEST. Sewage and Indust. Wastes, Vol. 28, No. 1, pp. 10-17; Biol. Absts., Vol. 32, No. 7, Abst. No. 22236. 1958.

This paper is a report of studies on the influence of selected synthetic detergents, surface-active agents and detergent builders on the standard dilution biological oxygen demand (BOD) test. A synthetic sewage of Difco lactose broth was used in this study. A working solution of this medium was prepared fresh every day by diluting 5 ml of sterile stock to 125 ml with distilled water. The working solution had a 5-day BOD of 350 ppm. The synthetic sewage was seeded with 1 ml of settled sewage/100 ml of working solution. Various syndets and surface-active agents ranging from commercial products to pure surface-active agents were investigated. Santomerse, Tide, Fab, Tween 80, CTAB and 1 GE Pal interfered with the DO titration. All of the anionic detergents tested increased the apparent BOD value of the synthetic sewage. Of the 2 nonionic detergents tested, Tween 80 in concentrations greater than 1 ppm was stimulatory to the microorganisms in the BOD test while 1 GE Pal was inhibitory in concentrations greater than 30 ppm. An excess of anionic detergent neutralized the inhibitory activity of the cationic syndets. (H. R. A.)

2009. Piskunov, I. A. 1955. ON THE BIOLOGY OF THE FORAGING HERRING INHABITING SOUTH-

WESTERN KAMCHATKA AND THE NORTHERN KURIL ISLANDS. (K BIOLOGII NAGUL'NOI SEL'DI OBITAYUSHCHEI U YUGOZAPADNOI KAMCHATKI I SEVERNYKH KURIL'SKIKH OSTROVOV. Voprosy Ikhtiol. 1955(4): pp. 63-70; Biol. Absts., Vol. 32, No. 7, Abst. No. 22243. 1958. (Translation)

In July-October 1952 during 2 voyages in a medium trawler, research catches of herring were conducted with drift-nets with 30-32 mm meshes set in 0-12 m. Simultaneously, the water temperature was measured and plankton was collected. In July-August, 23 out of 33 drifts made catches of herring (7 of the drifts yielded commercial catches, up to 0.5 centners/net). In September-October only 1 out of 17 drifts failed to make a commercial-size catch. Each set consisted of an average of 30 nets. The temperature of the horizon fished in July-August was 4-12°C, in September-October, 8-10°C. The quantity of plankton, in particular Calanus, euphausids and hyperlids, which constitute the food of the herring, was adequate. The herring were 245-360 mm in length and weighed 150-500 g (on the average, 318 g); this age was 4-16 years, 85% of the fish being 7-10 years old; most of the fish were in stage III of maturity; occasional individuals in stage IV, sexually immature, constituted 3%. The herring fed most intensively in July-August, and at the end of August they had attained a high degree of hypernutrition and fatness. The Kuril-Kamchatka foraging herring studied were, in age composition and rate of growth, closest to the herring of the Anapkin spawning schools, but differed in the prevalence of older ages. These herring may be an older segment of the Anapkin foraging population, or else a special population, spawning off the coast of Kamchatka south of Cape Kamchatka.

2010. Job, S. V. 1957. THE ROUTINE-ACTIVE OXYGEN CONSUMPTION OF THE MILK FISH. Proc. Indian Acad. Sci. Sect. B, Vol. 45, No. 6, pp. 302-313; Biol Absts., Vol. 32, No. 7, Abst. No. 22464. 1958.

The oxygen consumption of Chanos chanos (milk fish) was measured with fish ranging in weight from 0.7 to 11 g, both at 25° and 29°C. They were earlier acclimated to 29°C. During the experiments the fish were kept in a "routine state of activity". The oxygen consumption was measured under the high oxygen tension of 300 mm Hg, down to almost asphyxial levels. The critical tension of oxygen at which uptake of the gas becomes dependent upon the available oxygen, was around air-saturation levels (150 mm Hg), at the acclimation temperature of 29°C. With a sudden change in temperature (25°C) acting as an accessory factor, the critical tension varied considerably when related to size. A 0.7 g fish showed dependence even at 300 mm Hg pO_2. The size-temperature relationship for the routine-active metabolism revealed a proportionate rise in the metabolic rate at the higher temperature (29°C). The relative rate of increase is greatest in the smaller fish. The relative ability of the fish to utilize oxygen under proper acclimation (29°C) showed that it was the same under all partial pressures of the gas in the medium, irrespective of the size of the fish. Oxygen consumption is discussed in relation to live fish transport. (Auth. summ.)

2011. Mekhanik, F. Y. 1955. GROWTH AND METABOLISM IN THE YOUNG OF THE LADOGIAN SALMON AND RAINBOW TROUT AT VARIOUS TEMPERATURES. (ROST I OBMEN VESHCHESTV U MAL'KOV LADOZHSKOGO LOSOSYA I RADUZHNOI FORELI PRI RAZNYKH TEMPERATURAKH. Zool Zhur., Vol. 35, No. 2, pp. 290-299; Biol. Absts., Vol. 32, No. 7, Abst. No. 23356. 1958.

The changes in metabolism with temperature were studied. Growth, consumption of food, relationship of weight of the food consumed to the weight increment (food coefficient), digestion of the nitrogen substances of the food, and the amount of food nitrogen utilized were measured. In the initial stage of independent nutrition, the young of the ladogian salmon showed faster growth and greater utilization of food at 7-8°, and the young of the rainbow trout at 14-18°. For the young of the Ladogian salmon at the age of 60 days, 15° was optimal for growth. Preliminary training of the young of the rainbow trout at various temperatures influenced their subsequent reaction to an alteration of temperature conditions. A temperature of 13-18° in summer during the larval stage and in a certain period of independent nutrition, exerted a more favorable influence on the reaction than did 7-8°. Tables show nitrogen metabolism, growth and food utilization in the young of Ladogian salmon and rainbow trout of different ages at various temperatures.

2012. Schramm, G. 1957. REMARKS CONCERNING PHARMACOLOGY AND TOXICOLOGY OF THE CHINESE DRUG "HÊ - T'UN". Pharm. Zentralhalle Deutschland, Vol. 96, No. 7, pp. 333-335; Biol. Absts., Vol. 32, No. 7, Abst. No. 23504. 1958.

The fish Spheroides vermicularis is toxic in some months of the year. Fish caught during this period are used medicinally in China, especially as anti-parasitic drugs. (R. H.)

2013. Grodzinski, Z., and A. Pigon. 1956. THE RESPIRATORY RATE OF SEA-TROUT, SALMO TRUTTA L., HEART DURING EMBRYONAL DEVELOPMENT. Bull. Acad. Polonaise Sci., Vol. 4, Nos. 7 and 8, pp. 283-288; Biol. Absts., Vol. 32, No. 7, Abst. No. 23626. 1958.

The pulsation rate increases with age. The reduced weight (and, of course, dry mass) of the heart grows rapidly during development. Increase in thickness of the ventricle wall is of primary importance for the increase of RW (reduced weight) of the heart. Oxygen consumption increases from 6.9×10^{-3} µl, and 17.5×10^{-3} µl to 110×10^{-3} µl O_2/heart/hour. Oxygen consumption calculated/unit RW remains nearly constant during development. Oxygen consumption/µg. RW and per contraction decreases during development. (H. S.)

2014. Newth, C. R. 1956. ON THE NEURAL CREST OF THE LAMPREY EMBRYO. Jour. Embryol. and Exptl. Morphol., Vol. 4, No. 4, pp. 358-376; Biol. Absts., Vol. 32, No. 7, Abst. No. 23628. 1958.

2015. Yamamoto, Tadashi S. 1957. SOME EXPERIMENTS ON THE CHEMICAL CHANGES IN THE MEMBRANE OF SALMON EGGS OCCURRING AT THE TIME OF ACTIVATION. Japanese Jour. Ichthyol., Vol. 6, No. 3, pp. 54-58; Biol. Absts., Vol. 32, No. 7, Abst. No. 23633. 1958.

The author describes the action of various chemical solutions on the membrane of both fertilized and unfertilized eggs of Oncorhynchus keta and concludes that alkali probably inhibits the reaction between the membrane and the substance extruded from the egg at the time of activation. (M. G.)

2016. Yanagimachi, Ryuzo. 1957. STUDIES OF FERTILIZATION IN CLUPEA PALLASI. VI. FERTILIZATION OF THE EGG DEPRIVED OF THE MEMBRANE. (In Japanese with English summary.) Japanese Jour. Ichthyol., Vol. 6, No. 3, pp. 41-47; Biol. Absts., Vol. 32, No. 7, Abst. No. 23654. 1958.

The fertilization of the egg of C. pallasi is normally monospermic and experiments have shown that the membrane is the principal mechanism preventing polyspermy. (M. G.)

2017. Teichmann, H. 1957. GRADED DEFECTS OF NOSE AND EYES IN ABNORMAL LARVAE OF THE RAINBOW TROUT. (DEFEKTSTUFEN VON NASE UND AUGE BEI FEHLGEBILDETEN LARVEN DER REGENBOGENFORELLE (SALMO IRIDEUS W. GIBB).) Wilhelm Roux' Arch. Entwicklungsmech. Organ., Vol. 149, No. 3, pp. 365-386; Biol. Absts., Vol. 32, No. 7, Abst. No. 23667. 1958.

This paper is a study of naturally-occurring head defects in hatchery-bred trout fixed at 41-56 days of age. Defects were frequently found in nose, eyes, forebrain, and visceral skeleton, but never in the mind-brain or ears. The fact that the nostrils and eyes were often abnormal to an equal degree, on one or both sides, argues for some interdependence of these two organs in development. (F. M.)

2018. Baburina, E. A. 1955. STRUCTURE OF THE EYE AND ITS RETINA IN THE COMMON NORTHERN PILCHARD. (STROENIE GLAZA I EGO SETCHATKI U OBYKNOVENNOI KIL'KI.) Doklady Akad. Nauk SSSR, Vol. 102, No. 3, pp. 625-628; Biol. Absts., Vol. 32, No. 7, Abst. No. 23677. 1958.

The eyes of the northern pilchard were fixed in Zenker's fluid and stained with azodye by Heidenhain's method. The retinal bulbs were large, more often paired; the rods are numerous and external, their members minute and long. The ratio of the number of rods to bulbs was 1:22.4-1:32.7. In a single cell of the interior nuclear layer there were 4-8 receptors (rod and bulb). There were few ganglionic cells, in one there were 12.1-17.9 cells in the interior nuclear layer. In the lower posterior part of the eyeground there is a zone of heightened visual acuity: the number of rods here is lower, the number of bulbs higher in comparison with the rest of the retina. In this region the bulbs have smaller dimensions, the number of cells of the interior nuclear and ganglionic layers is increased. The ratio of the number of cells of the interior nuclear layer to the number of ganglionic cells is from 1:9.7 to 1:10.9. The author finds a resemblance between the structure of the eye of the northern pilchard and that of the sardine and sprat, and connects this with an opinion on the significance of the region of increased visual acuity for nutrition in the bright time of day.

2019. Kapoor, B. G. 1957. THE DIGESTIVE TUBE OF AN OMNIVOROUS CYPRINOID FISH, BARBUS STIGMA (CUV. AND VAL.). Japanese Jour. Ichthyol., Vol. 6, No. 3, pp. 48-53; Biol. Absts., Vol. 32, No. 7, Abst. No. 23679. 1958.

Both the gross and microscopic anatomy of the digestive tube of B. stigma are described, and points of anatomical and histological interest are summarized. (M. G.)

2020. Tsukamoto, Yoshikazu, and Shizuo Yoshino. 1957. A STUDY OF THE LATERAL LINE SYSTEM IN FISH. I. QUANTITATIVE ANALYSIS OF FIBER CALIBERS IN THE LATERAL LINE NERVES OF FISHES. Japanese Jour. Ichthyol., Vol. 6, No. 3, pp. 59-64; Biol. Absts., Vol. 32, No. 7, Abst. No. 23681. 1958.

A quantitative analysis was made of the fiber-diameter of the lateral line nerves of 81 species of teleosts. The proportion of thinner and thicker fibers was found to differ in each species but showed no specific variation, and the species studied have been divided into groups based on the size of the fibers. (M. G.)

2021. Uspenskaya, A. V. 1955. ON THE BIOLOGY AND DIFFUSION OF M. CEREBRALIS--THE ETIOLOGICAL AGENT OF VERTIGO IN TROUT. (K BIOLOGII I RASPROSTRANENIYU MYXOSOMA CEREBRALIS (HOFER, 1903) (PLEHN, 1905)--VOZBUDITELYA VERTEZHA FORELI.) Doklady Akad. Nauk SSSR, Vol. 105, No. 5, pp. 1132-1135; Biol. Absts., Vol. 32, No. 7, Abst. No. 25116. 1958.

Some trout fry transferred to a pool in the Leningrad district in autumn were markedly depleted by winter. The fish were 100% infected with M. cerebralis. With the usual methods of investigation, only the spores were discovered. Data are presented on the distribution of the parasite, according to age and organs of the fish, and according to the seasons of the year. Loss of the trout with vertigo occurs only at an early age. A description is given of the disease picture. Three measures are recommended for control: prophylactic measures, treatment of

the sick fish, and the creation of conditions which stimulate growth and improve the nutrition of the young.

2022. Figueras, A. 1957. ON THE AGE AND GROWTH OF THE ALBACORE (G. ALALUNGA). (DATOS SOBRE LA EDAD Y CRECIMIENTO DE LA ALBACORA (GERMO ALALUNGA BONNATERRE).) Invest. Pesq., Vol. 9, pp. 27-31; Biol. Absts., Vol. 32, No. 7, Abst. No. 25390. 1958.

Sixty-seven specimens from the NW Spanish coast were measured and the concentric marks in the centra of their vertebrae registered. The mean length of albacore (both sexes) is: 1st year, 17-18 cm; 2d year, 31-32 cm; 3d year, 44-45 cm; 44-45 cm; 4th year, 56-57 cm; 5th year, 69-70 cm; 6th year, 81-82 cm; 7th year, 91-93 cm. (R. M.)

2023. Hatanaka, Masayoshi, Kiyonari Sekino, Masao Takahashi, and Takemi Ichimura. 1957. GROWTH AND FOOD CONSUMPTION IN YOUNG MACKEREL, PNEUMATOPHORUS JAPONICUS (HOUTTUYN). Tohoku Jour. Agric. Res., Vol. 7, No. 4, pp. 351-368; Biol. Absts., Vol. 32, No. 7, Abst. No. 25392. 1958.

This sp. appears on the e. coast of Japan in spring (the mackerel of the w. coast is a distinguishable population, P. tapeinocephalus). Individuals in their first year grow to a length of 20 cm, and in their 2d year to 26 cm; they migrate n., the largest fish moving fastest, and disappear into the ocean in winter. Their food in the early part of the year is mostly the crustacean Euphausia; later it is mostly anchovies. Tank experiments show lower amounts of food used in proportion to size, and lower rates of growth, as size increases; the ratios are lower at lower temperatures. (H. F. C.)

2024. Klyuchareva, O. A. 1956. CERTAIN QUESTIONS CONCERNING THE INTRA-SPECIES RELATIONSHIPS IN FISH. (O NEKOTORYKH VOPROSAKH VNUTRIVIDOVYKH OTNOSHENY U RYB.) Zool. Zhur., Vol. 35, No. 2, pp. 275-289; Biol. Absts., Vol. 32, No. 7, Abst. No. 25393. 1958. (Translation)

The question of the significance of intraspecific carnivorousness in fish is discussed. The suggestion of V. A. Movchan, that carnivorous fish are unable to grow and reproduce normally by means of eating other individuals of the same species (see Referat. Zhur., Biol., 1954, No. 6870; 1956, No. 29957), is disproved. Detailed material from the literature and data from the investigations of the author are brought forward, from which it follows that using individuals of one's own species as food is quite widespread in the class of fishes; the representatives of at least 12 families out of 8 orders of fish actively consume individuals of their own species under natural conditions. The author believes that cannabalism developed among the fishes as the result of certain advantages in the relative size of carnivore and victim. The cannibals consume much more food than the victims and therefore grow more rapidly. The rates of growth of cannibalistic and non-cannibalistic perches are approximately proportional to the amounts of food contained in their stomachs. The change-over of fish to feeding on their own young is looked upon as one of the adaptations which are directed toward the preservation of the species and the regulation of the numerical size of the school during improved nutritional conditions (G. V. Nikol'sky, 1953 and S. G. Kryzhanovsky, 1953). A decrease in the number of fish makes possible the survival of less exhausted individuals which are better protected against carnivores and are resistant to epizootics. Intraspecific carnivorousness is differentiated from the inter-specific type; the latter, which regulates the number of species, leads to incomplete utilization of the food supply and limits the range of habitation of the species. Intraspecific carnivorousness, on the other land, leads to the fullest utilization of the food supply and expands the range of habitation of the species. In his work, Movchan committed a methodological error. While studying the intraspecific relationships in fish, he disassociated the biological relationships and the physiological processes of nutrition, which cannot be separated. The choice of object (the pike) was also unfortunate; the pike, a typical carnivore, is polyphagic in captivity, but Movchan transformed it by force into a monophage. In nature, cannibalism in the pike is an accidental or forced phenomenon and only occurs when the concentration of its own young in the reservoir attains a high value. The author brings out the fact that Movchan's experimental pike were starved while the controls received sufficient food (the quantitative figures are presented), and that his experimental results can therefore not be compared. The factual material in Movchan's experiments does not support the theoretical conclusions which he has drawn. The fact that fish eat their own kind has great biological significance. Intraspecific carnivorousness regulates the numerical size of the species (in conformity with the degree to which they are provided with food), expands its range of distribution, and the species populate those reservoirs where there would not be sufficient food for the mature individuals.

2025. Jaag, O. 1957. PROBLEMS OF SMALL STREAMS. (VORFLUT-PROBLEME.) Schweiz. Zeitschr. Hydrol., Vol. 19, No. 1, pp. 213-242; Biol. Absts., Vol. 32, No. 8, Abst. No. 25953. 1958.

The biological consequences of pollution of streams are reviewed. Methods are described for determination of the purity of the water, as follows: (1) bacterial analysis, and (2) physical-chemical analysis (i. e., analysis of temperature, pH, content of organic substances, oxygen content and distribution, etc. The pollution load can also be estimated biologically by the presence of indicator species, and by the entire aspect of the community or organisms. The amount of purification needed depends upon local circumstances, and primarily upon self-purification ability of each individual stream. This ability needs to be tested carefully before planning

the details of the purification system. (C. C. D.)

2026. Lackey, J. B., W. T. Callaway, and G. B. Morgan. 1956. BIOLOGICAL PURIFICATION OF CITRUS WASTES. Sewage and Indust. Wastes, Vol. 28, No. 4, pp. 538-546; Biol. Absts., Vol. 32, No. 8, Abst. No. 25955. 1958.

Experimental studies on purification of citrus wastes indicated that these wastes could be treated biologically, provided certain routines are followed. The waste should be diluted to a maximum BOD of 3500. Treatment with lime to achieve a pH value of 9.0, followed by mechanical flocculation and removal of flocculated solids is required. Time of aeration ranges from 6 to 8 hours and N and P must be added for optimum bacterial activity. (H. R. A.)

2027. Monod, René. 1956. CONTRIBUTION TO THE STUDY OF VARIATIONS OF THE CHEMICAL COMPOSITION OF THE WATER OF LAKE LÉMAN. PHENOMENA OF POLLUTION AND OF SELF-PURIFICATION AT THE MOUTH OF THE FLON AT VIDY. (CONTRIBUTION À L'ÉTUDE DES VARIATIONS DE LA COMPOSITION CHIMIQUE DE L'EAU DU LAC LÉMAN. PHÉNOMÈNES DE POLLUTION ET D'AUTOÉPURATION À L'EMBOUCHURE DU FLON Á VIDY. Ann. Sta. Centrale Hydrobiol. Appl., Vol. 6, pp. 231-345; Biol. Absts., Vol. 32, No. 8, Abst. No. 25957. 1958.

Lake Léman has been studied previously in great detail by Forel and others. The Flon River carries a heavy pollution load when it empties into the lake at Vidy. The object was to study the effect of the polluted Flon water upon the lake in the immediate vicinity of the outlet in the years 1953 to 1955, both for knowledge of the existing conditions compared to previous conditions, and to gather data of value for future comparison, when the pending disposal plant is constructed at Vidy. All stations were in a radius of 150 m of the subsurface termination of the conduit that was built to carry the Flon water away from the shore. The chemistry of the water was examined, as well as the bacterial content, and the bottom sediments. During the last 60 years there apparently has been little chemical variation of the water. However, the transparency of the water has diminished, and the effect of pollution is indicated by the marked supersaturation of oxygen in the superficial layers of the water during the warm season. This is associated with the large increase of photosynthetic organisms in the superficial layers, which in turn is a reflection of the enriched supply of plant nutrients. Nitrites were detected for the first time in Lake Léman. This is interpreted as being caused by the heavy pollution with nitrogenous substances, the load being so great that the nitrifying bacteria could not handle it and completely transform it to nitrate. The sediments showed a zone, whose extent and depth are not yet known, possessing all the characteristics of an advanced eutrophy. (C. C. D.)

2028. Müller, Karl. 1956. THE INTERPLAY BETWEEN LAKE AND RIVER IN BIOLOGICAL PRODUCTION. (DAS PRODUKTIONSBIOLOGISCHE ZUSAMMENSPIEL ZWISCHEN SEE UND FLUSS.) Ber. Limnol. Fluss Sta. Freudenthal 7, pp. 1-8; Biol. Absts., Vol. 32, No. 8, Abst. No. 25960. 1958.

Observations were made of the benthic fauna and suspended organic matter at stations on the inlets to Annsjon, Sweden, and at 2 stations on the outlet. Of the last, one station was near the lake, and the 2d was a considerable distance downstream. Both benthic fauna and suspended organic matter were abundant in the outlet near the lake, but both were sparse at the other 3 stations. Most abundant of the benthic spp. at the rich station were net-building trichopteran larvae. It is thought that the plankton produced in the lake serves as a rich food for an abundant benthic fauna in the outlet near the lake. At a distance from the source of supply, however, the quantity of plankton is greatly reduced, and therefore benthic fauna is sparse. Trout populations also are greater in outlets near lakes than elsewhere. (C. C. D.)

2029. Sabaneff, Peter. 1956. CONCERNING THE ZOOPLANKTON OF THE WESER. (ÜBER DAS ZOOPLANKTON DER WESER.) Ver. Limnol. Fluss Sta. Freudenthal 7, pp. 28-42; Biol. Absts., Vol. 32, No. 8, Abst. No. 25963. 1958.

Zooplankton was collected quantitatively at a number of stations of the Weser and its tributaries on 2 separate trips, in July and August. The zooplankton consists of true planktonic forms, and of planktobenthic forms. True plankters are largely allochthonous, coming to the Weser from its tributaries, whereas the tychoplankters are autochthonous, being washed up from the bottom locally. Weser zooplankton is sparse compared with other similar rivers. The sparsity is thought due to the high turbidity and to the high salt content of the water (from industrial effluents). Mixing of water from tributaries occurred quickly, as judged by analysis of zooplankton samples taken from both banks of the Weser downstream from the entry point of the tributaries. (C. C. D.)

2030. Saunders, George W. 1957. INTERRELATIONS OF DISSOLVED ORGANIC MATTER AND PHYTOPLANKTON. Bot. Rev. Vol. 23, No. 6, pp. 389-409; Biol. Absts., Vol. 32, No. 8, Abst. No. 25964. 1958.

The sources of dissolved organic matter and the evidence for its presence in natural waters are reviewed. Dissolved organic matter may function in 4 fundamental ways with regard to phytoplankton and other organisms: (1) as basic sources of energy or nutrients for growth, (2) as accessory growth factors, (3) as toxins or antibiotics, and (4) as influencing agents on the availability of trace metals. The indirect and direct evidence for these functions is presented. The ecological importance of these functions with regard to the basic physiology of phytoplankton, distribution of phytoplankton in time and space, and exclusion effect toward zooplankton

is discussed. Finally, approaches to the quantitative determination of ecological effects of dissolved organic matter are mentioned. (G. W. S.)

2031. Anonymous. 1950. COMMISSIONE INTERNAZIONALE PER L'ESPLORAZIONE SCIENTIFICA DEL MARE MEDITERRANEO. Bibliographica Oceanographica, Vol. 23, 521 pgs.; Biol. Absts., Vol. 32, No. 8, Abst. No. 25569. 1958.

This volume covers material published in 1950. It differs from the preceding issues in that brief abstracts are given in English as well as in Italian. Changes have also been made in the method of classification of the material. The present system is that developed by the Food and Agricultural Organization (FAO) for fisheries science. A list of periodical names is given, with their abbreviations. Over 2400 references are listed, each with the brief abstracts in Italian and English. An author index is added.

2032. Stube, Maj. 1958. THE FAUNA OF A REGULATED LAKE. Report No. 39 from the Institute of Freshwater Research. Sweden. pp. 162-224.

One of the most extensive regulations of lakes of later times in Sweden has been carried out in Lake Borgasjon, belonging to the drainage system of Angermanalven. The amplitude of the regulation was 18 metres.

An examination of the fauna in the uppermost one of the deltas in the River Sannaran, connecting Borgasjon with the more elevated Lake Sannaren, was carried out in 1948 and 1949, prior to the regulation of the lake and later, in 1954 and 1957, when the lake had been under the influence of the regulation for two and five years, respectively. The interest was centered on the epifauna in the months June, July, and August 1949 before the regulation, but also bottom fauna and fish fauna were studied. Findings are presented. (From auth. summ.)

2033. Deterline, William A. 1956. AN AUTOMATIC DEVICE FOR THE INVESTIGATION OF OPERANT BEHAVIOR IN FISH. Amer. Jour. Psychol., Vol. 69, pp. 291-295; Biol. Absts., Vol. 32, No. 8, Abst. No. 25817. 1958.

The apparatus described and illustrated is suitable for the study of operant learning and operant discrimination. Illustrative data are reported. (R. H. W.)

2034. Gorham, E. 1957. THE INFLUENCE AND IMPORTANCE OF DAILY WEATHER CONDITIONS IN THE SUPPLY OF CHLORIDE, SULPHATE AND OTHER IONS TO FRESH WATERS FROM ATMOSPHERIC PRECIPITATION. Phil. Trans. Roy. Soc. London, Ser. B. Biol. Sci., Vol. 241, No. 679, pp. 147-178; Biol. Absts., Vol. 32, No. 8, Abst. No. 25854. 1958.

This paper deals with chemical analyses for hydrogen, sodium, potassium, calcium, chloride, sulphate and nitrate ions in daily precipitation samples collected in the English Lake District, and examines the correlations of these analyses with one another, the amount of precipitation, wind direction, wind velocity, and temperature. (From auth. summ.)

2035. Ramasastry, A. A., and C. Balaramamurty. 1957. THERMAL FIELD AND OCEANIC CIRCULATION ALONG THE EAST COAST OF INDIA. Proc. Indian Acad. Sci. Sect. B., Vol. 46, No. 5, pp. 293-323; Biol. Absts., Vol. 32, No. 8, Abst. No. 25925. 1958.

From bathythermographic data, collected during the first 19 cruises of the Andhra University during the period Oct., 1952, to April, 1953, along the east coast of India, thermal fields at surface, 40, 100, 200-, and 400-feet levels have been constructed for the three seasons, viz., post-monsoon, winter, and summer seasons. The present study is confined to the coastal region between latitudes 13°N. to 18°N. and longitudes 80°E. to 84°E. In addition to this area, during winter season the study has been extended to an area over the "Swatch of No Ground." From the above, circulation was deduced and the current directions were entered on the charts. Limitations and the validity of the method in entering the current directions are discussed and further it is shown, from a consideration of the current boundaries, that the method yields a fairly good representation of the oceanic circulation at various depths. Seasonal variation in the thermal structure and the associated circulation is presented. In the post-monsoon and hot weather seasons the current pattern indicates turbulence in the surface layers as a consequence of sinking and upwelling. Greater turbulence occurs off Visakhapatnam than off Madras. At a level at which thermocline forms, currents are opposing to those found above and below that level. A nearly isothermal water mass which forms over the continental shelf during the hot weather season appears as a semipermanent feature, keeping its position due to the existing north-easterly current. (From auth. summ.

2036. Waldichuk, M. 1956. PULP MILL POLLUTION IN ALBERNI HARBOR, BRITISH COLUMBIA. Sewage and Indus. Wastes, Vol. 28, No. 2, pp. 199-205; Biol. Absts., Vol. 32, No. 8, Abst. No. 25929. 1958.

A comprehensive survey was conducted of Alberni Harbor which received waste from an unbleached kraft mill. No O_2 shortage existed in the surface water of Alberni Harbor except in the immediate vicinity of the pulp mill sewer outfall. Discharge of waste at the surface takes advantage of the seaward flow, high dissolved O_2 in the surface water, as well as wind aeration. Deep water was already depleted of O_2 and would not support much oxidation of foreign material. (H. R. A.)

2037. Solewski, W. 1957. THE STRUCTURE AND VASCULARIZATION OF THE PSEUDOBRANCH IN THE RAINBOW TROUT, SALMO IRIDEUS GIBB. (BUDOWA I UNACZYNIENIE NIBYSKRZELI PSEUDO-

BRANCHIUM U PSTRAGA TECZOWEGO SALMO IRIDEUS GIBB.) (In Polish with English summ.) Folia Morphol., Vol. 8, No. 1, pp. 27-33; Biol. Absts., Vol. 32, No. 8, Abst. No. 26531. 1958.

The principal arteries of the pseudobranch run longitudinally. They derive from mandibular and hyoid arterial arches. In every gill lamella an arteriole branches into sinusoidal capillaries. There are about 9000 lamellae in the whole organ. The surface on one lamella averages 0.13 mm^2. (H. S.)

2038. Azbelev, V. V., and I. I. Lagunov. 1956. SOME DATA ON THE SEA MIGRATIONS OF SALMON. (NEKETORYE DANNYE O MORSKIKH MIGRATSIYAKH SEMGI.) Voprosy Ikhtiol., 1956, No. 6, pp. 113-120 (Translation); Biol. Absts., Vol. 32, No. 8, Abst. No. 25972. 1958.

After descending from rivers, young salmon remain not far from the shore; at the beginning of winter they leave the White Sea. New data were obtained on the dispersal of salmon in the Norwegian Sea. Capture of Baltic salmon in the central part of the Norwegian Sea indicates that this salmon probably feeds in the Norwegian Sea, along with salmon from the rivers of Norway and rivers of the Barents and White Sea basins.

2039. Egorov, A. G. 1956. TAGGING OF GRAYLING IN THE ANGARA RIVER. (MECHENIE KHARIUSA NA R. ANGARE.) Voprosy Ikhthiol., 1956, No. 6, p. 121; Biol. Absts., Vol. 32, No. 8, Abst. No. 25980. 1958. (Translation)

Tagging indicated that the grayling does not perform distant mass migrations down- and upstream in the Angara River. Therefore, installation of fishways in the hydroelectric dam is not necessary.

2040. Kuznetsova, I. I. 1955. ECOLOGICAL AND PHYSIOLOGICAL OBSERVATIONS ON THE YOUNG OF THE PIKE-PERCH IN A PISCICULTURAL ESTABLISHMENT OF THE VOLGA DELTA. (EKOLO-FIZIOLOGICHESKIE NABLYUDENIYA NAD MOLOD'YU SUDAKA V RYBOVODNOM SKOZYAISTVE DEL'TY VOLGI.) Voprosy Ikhtiol. 1955, No. 4, pp. 159-172; Biol. Absts., Vol. 32, No. 8, Abst. No. 25987. 1958. (Translation)

The rearing of the sander or pike-perch (Lucioperca), together with the young of other fish, in a spawning-cultivation establishment of the Volga delta is described. On April 24-25, 1953, in the "Kolyshnyi" fish-farm (in the period of maximal inundation of the reservoir to 1400 hectare), 5,000 sander spawners were put in, and on April 28-May 10, 8,000 carp and 60,000 bream; young of the vobla (Leuciscus rutilus caspicus) of Blicca bioerkna, of redfin (Scardinia), and of minnows (Alburnus), penetrated from the river into the fish-farm. The sander spawns from April 25 to May 10 at 6.12°. On June 25 the liberation of young into the river began. For the determination of the species composition of the young and their distribution around the pond, catches were made with a spawn net (from May 10 to June 1) and with a "scraper" (from June 1 to 29). From May 10 to June 1 (the period of yolk nutrition and feeding on zooplankton) the young of the sander kept to the canals through which the water was conducted; some of the young were carried away and perished in sections ploughed up in the preceding year. The young of the carp, bream, and vobla were found only in catches from the shores, in approximately equal numbers; there were a few minnows and many more redfin (at one station). This separation of the sites of habitation of the young of carp and sander during the period of feeding on zooplankton (it depends on the higher requirement of the sander for oxygen as compared to carp) leads to more complete utilization of food. In places with an oxygen content in the water of 5-6 mg/liter young sanders were absent, and in experiments with a water oxygen content of 4.5 mg/liter they died. The sander began to feed itself at a length of 6-7 mm; its food consisted at first of juvenile, and later of mature, forms of Cladocera and Copepoda; from June 1 the fry of carp appeared in the food (coming out of the shore zone in search of zooplankton, they became accessible to the sander). At the beginning of its changeover predacious feeding the sander consumed vobla 11-14 mm long, afterwards carp 13-16 mm long. The bream, thanks to its greater mobility, was at first inaccessible to the sander; in the middle of June bream (16-35 mm in length), and carp (28-58 mm in length) were eaten in the greatest quantity, and the importance of the vobla (18-40 mm in length) in the nutrition of the sander had decreased. At the end of June the sander fed itself on bream, vobla, and undersized carp of a length of 22-28 mm. The daily food ration was determined by nitrogen balance experiments (5 experiments with 299 specimens), and also, at the time of predatory nutrition, by the method of feeding with abundant food (19 experiments on 33 specimens weighing 0.5-13.5 g). The results obtained by the two methods were close. The daily food ration of the sander in mid-May, during its feeding on zooplankton, constituted 122.4% of its own weight; at the end of May 34.2%; and in the period of predacious feeding, about 20%; its food coefficient in the predacious period was 1.9. From these data, it was found that by the middle of June a sander weighing 0.6-0.7 g. requires 2 g. of food. On recalculation using the fry of carp, in the first ten days of June, 10 fry are required for a single sander, in the second 10 days 20 are needed, and in third 10 days, 30. The young of the sander must be let out of the fish-farm in the middle of June (when the massive descent of the vobla through the river occurs), rearing it on the young of the vobla coming in from the river, or together with the young of the carp for the best utilization of coastal zooplankton. Regulation of the time and density of placement of carp producers in the fish-farm can avert the eating out of its young, characterized by rapid growth, by the sander.

2041. Neiman, A. A. 1955. CONTRIBUTION TO A STUDY OF SPAWNING OF THE OMUL,

COREGONUS MIGRATORIUS GEORGI, IN TRIBUTARIES OF THE "LITTLE SEA" OF LAKE BAIKAL. (MATERIALY K KHARAKTERISTIKE NERESTA OMULYA, COREGONUS MIGRATORIUS GEORGI, V PRITOKAKH MALOGO MORYA OZERA BAIKAL.) Voprosy Ikhtiol., 1955, No. 5, pp. 53-60; Biol. Absts., Vol. 32, No. 8, Abst. No. 25992. 1958.

Spawning sites of omul (a kind of whitefish) in tributaries of the Little Sea were discovered in the Sarma and Kuchelga Rivers. The chivyrkui whitefish, distinguished by its larger size, also spawns in these rivers (by meristic criteria it is closest to the chivyrkui type). The habitat of the omul outside of the spawning period is unknown. The chivyrkui matures partly at the age of 5 years, but principally at 6. Spawning grounds of omul in the Sarma River are located in the central and upper reaches of the left and central branches, in a zone 800-1200 m. from the estuary. In the Kuchelga River spawning grounds may be no farther than 3 m. from the estuary. The spawning run of omul in the rivers Sarma and Kuchelga is not numerous, due to the unfavorable hydrologic regime on the spawning grounds, the abundance of predators in the Gulf of Mukhor, the yearly unrestricted catch, and the small area of the spawning grounds. For the protection of omul in the Sarga and Kuchelga, fishing must be prohibited from Sept. 15 to Nov. 15 and piscicultural station must be built.

2042. Shturbina, M. A. 1955. THE RELATION OF THE QUALITY OF STURGEON FRY OBTAINED BY PISCICULTURISTS TO THE INDIVIDUAL CHARACTERISTICS OF THE ROE. (ZAVISIMOST KACHESTVA POLUCHAEMOI RYBOVODAMI OSETROVOI MOLODI OT INDIVIDUAL'NYKH OSOBENNOSTEI IKRY.) Voprosy Ikhtiol., 1955, No. 4, pp. 105-113; Biol. Absts., Vol. 32, No. 8, Abst. No. 25994. 1958. (Translation)

Artificially fertilized eggs from the anterior, middle, and posterior parts of the ovary of hypophysis-treated Volga oseotr (Acipenser guldenstadti), and naturally maturing roe of the Volga sevringa (A. stellatus), were incubated separately in Chalikov's apparatus at a temperature of 11-13° (A. guldenstadti) and 22-24° (A. stellatus). Eggs from the various parts of the ovary differ in size, rate of growth and percentage of developing spawn; the largest, fastest, and best developed spawn are found in the posterior region. Emergence of the larva from eggs in the anterior region of the ovary is delayed; in these eggs the majority of emergences are observed in the incubation period. Development and growth of the fry of A. guldenstadti from eggs of the posterior part of the ovary takes place more rapidly; these fry begin mixed feeding two days earlier, and at the age of 85 days they weigh 3 times more (4.89 g) than fry from eggs in the anterior part. Similar differences in the rate of growth and development are also observed in the fry of A. stellatus. Loss of fry (during the 1 1/2 months after the time of emergence) from eggs in the posterior part was, in A. guldenstadti, 6.8%, in A. stellatus, 2.5%; in fry from eggs in the anterior part, 30% and 15%, respectively. For rearing fry artificially, eggs from the posterior and middle regions of the ovary should be utilized.

2043. Swain, A., and O. F. Newman. 1957. HYDROGRAPHICAL SURVEY OF THE RIVER USK. Min. Agric., and Fish. and Food (Gt. Brit.) Fish. Invest., Ser. I., Vol. 6, No. 1, pp. 1-34; Biol. Absts., Vol. 32, No. 8, Abst. No. 25996. 1958.

The River Usk surveys began in 1950 to investigate the condition of the river before the proposed Uskmouth Power Station was set into operation. As the river holds a good stock of migratory fish the aim of the survey was to find out what effect the discharge of large quantities of heated water would have on the general condition of the estuary. Surveys were carried out at 3 periods each year since 1950. Although the Uskmouth Power Station commenced operation at the end of 1952, and was working at about two-thirds of capacity by the end of 1955, there has been no significant change in the condition of the river and any heating effect caused by the discharge of hot water has been intermittent and local. (Auth. summ.)

2044. Vladimirskaya, M. I. 1956. WHITEFISHES OF THE DRAINAGE BASIN OF LAKE IMANDRA. (SIGI BASSEINA OZERA IMANDRY.) Voprosy Ikhtiol., 1956, No. 6, pp. 136-148; Biol. Absts., Vol. 32, No. 8, Abst. No. 26000. 1958. (Translation)

Results of an ichthyological exploration of lakes in the former Lapland national forest on the Kola peninsula and some information about the biology of fish inhabiting these ponds (growth of whitefish in ponds of different types, age composition of females and males in foraging populations, age composition of females and males among whitefish during spawning, fecundity of whitefish in different ponds, and whitefish food).

2045. Krayukhin, B. V. 1955. THE INFLUENCE OF LOW TEMPERATURES ON THE NUTRITIVE REACTION OF THE CURRENT YEAR'S CARP. (VLIYANIE NIZKIKH TEMPERATUR NA PISHCHEVUYU REAKTSIYU SEGOLETKOV KARPA.) Voprosy Ikhtiol., 1955, No. 5, pp. 28-33; Biol. Absts., Vol. 32, No. 8, Abst. No. 27063. 1958. (Translation)

The influence of low temperatures on the feeding reaction of this year's carp was studied by the method of Pegel by determination of the "latent feeding time". Over 500 experiments were carried out at a temperature of from 20 to 30°. The rate of the feeding reactions was linearly related to the temperature, which indicates a dependence of the nervous activity of the fish on the surrounding environment. The rate of the reaction and the lower threshold of nutrition in low temperatures are influenced by the different reactivity and functional status of the fish, the degree of fattening, and the previous temperature experience. The lower limit of the feeding reaction and of nutrition in experimental conditions was about 4°.

2046. Trout, D. L. 1957. A METHOD OF ESTIMATING DRUG EFFECTS ON CENTRAL EXCITABILITY OF THE SIAMESE FIGHTING FISH. Arch. Internatl. Pharmacodyn., Vol. 113, No. 3, pp. 334-341; Biol. Absts., Vol. 32, No. 8, Abst. No. 27198. 1958.

Muscle action potentials produce rapid fluctuations in the electropotential field about the fish, and these are recorded by a Grass encephalogram. The assay animal is the Siamese fighting fish (Betta splendens); a controlled test, involving hypoxia, is imposed. Details of the method and apparatus are described. Chlorpromazine reduced the stress response and had an effect on chromatophores opposite to that of reserpine; metrazole antagonized chlorpromazine depression. (F. A. N.)

2047. Doudoroff, P. 1956. SOME EXPERIMENTS ON THE TOXICITY OF COMPLEX CYANIDES TO FISH. Sewage and Indust. Wastes, Vol. 28, No. 8, pp. 1020-1040; Biol. Absts., Vol. 32, No. 8, Abst. No. 27208. 1958.

Toxicity to minnows, Pimephales promelas, of mixed solutions of NaCN and heavy metal sulfates was studied. Zinc and cadmium cyanides were more toxic than cyanide alone, due to their high degree of ionic dissociation and the synergistic action of the Zn and Cd ions. The nickel cyanide complex is less toxic than cyanide alone, due to its low degree of dissociation. Hydrogen ion concentration has a marked effect on nickelocyanide toxicity at pH 8.0 or lower since it controls the formation of undissociated hydrogen cyanide which is the toxic form. Free cyanide concentration in waste waters containing complex cyanides as well is no reliable measure of waste toxicity since under certain pH conditions the complex cyanides can be converted to HCN. Addition of nickel salts to cyanide solutions to form a complex can be an effective detoxification procedure where there is assurance that receiving water pH will remain high enough to prevent dissociation of the complex. Toxicity of waste waters containing Cu ions can similarly be reduced by addition of cyanides to form a complex copper cyanide. (I. G.)

2048. Klinger, K. 1957. SODIUM NITRITE, A SLOW-ACTING FISH POISON. (NATRIUMNITRIT, EIN LANGSAMWIRKENDES FISCHGIFT.) Schweitz. Zeitschr. Hydrol., Vol. 19, No. 2, pp. 565-578; Biol. Absts., Vol. 32, No. 8, Abst. No. 27214. 1958.

Minnows (Phoxinus laevis) were tested in solutions of $NaNO_2$ from 0.01 to 10 g/l. Reactions of the fish to the poison, time of death, and anatomical and histological changes are described. The mode of action of the poison is not clear, and further investigation is called for. It is certain, however, that there is a destruction of the blood pigment, and also a toxic damage to the central nervous system. It is not clear whether the $NaNO_2$ causes a transformation of hemoglobin into methemoglobin in vivo, as it does in vitro when $NaNO_2$ is mixed with hemoglobin. (C. C. D.)

2049. Morris, R. 1957. SOME ASPECTS OF THE STRUCTURE AND CYTOLOGY OF THE GILLS OF LAMPETRA FLUVIATILIS. Quart. Jour. Microsc. Sci., Vol. 98, pp. 473-485; Biol. Absts., Vol. 32, No. 8, Abst. No. 27438. 1958.

The structure and vascularization of the lamprey gill is described. Changes take place in the cellular components of the gill epithelium as the animals enter fresh water at the beginning of their spawning migration. There is a progressive loss of certain cells which resemble teleost chloride excretory cells. They are replaced by a new cell type which is thought to be responsible for ion uptake from fresh water. In male lampreys, large glandular cells of unknown function appear in the gill epithelium as these animals approach spawning time. (Auth. abst.)

2050. Kincl, F. A., and J. Gedeon. 1957. THE SAPOGENINS OF CAREYA ARBOREA (MYRTACEAE). Arch. Pharm. u. Ber. deutsch. pharm. Ges., Vol. 290, No. 62, pp. 578-579; Biol. Absts., Vol. 32, No. 8, Abst. No. 28424. 1958.

The bark of the tree is used in India as an anthelmintic, and the roots, stem, bark and leaves are known to be toxic for fishes. According to the authors all organs of this plant contain saponins. The fruits were extracted with water and the extract hydrolyzed. From the hydrolysate 1.5% of crude sapogenin was isolated. From the crude sapogenin pure sapogenin A and sapogenin B were obtained. The latter are not characterized chemically. (R. H.)

2051. Polyansky, Y. I. 1955. CONTRIBUTION TO THE PARASITOLOGY OF FISH IN THE NORTHERN SEAS OF THE USSR. PARASITES OF FISH OF THE BERING SEA. (MATERIALY PO PARAZITOLOGII RYB SEVERNYKH MOREI SSSR. PARAZITY RYB BARENTSOVA MORYA.) Trudy Zool. Inst. Akad. Nauk SSSR, 1955, No. 19, pp. 5-170; Biol. Absts., Vol. 32, No. 8, Abstract No. 28685. 1958. (Translation)

In the investigation of 1003 specimens of fish, belonging to 47 species, 136 species of parasites were discovered (protozoa, worms, crustacea), 11 of which are described for the first time. A systematic, zoogeographic and ecologic-faunistic analysis is given of the parasite fauna of the fish studied, and the author indicates the economic significance of the parasites, appropriate prophylactic measures against diseases of commercial fish, and the significance of the findings in the ecology of the fish.

2052. Salo, Ernest O., and William H. Bayliff. 1958. ARTIFICIAL AND NATURAL PRODUCTION OF SILVER SALMON, ONCORHYNCHUS KISUTCH, AT MINTER CREEK, WASHINGTON. Washington Dept. Fish. Res. Bull. 4, pp. 1-82; Biol. Absts., Vol. 32, No. 8, Abst. No. 28971. 1958.

In order to evaluate production of O. kisutch, and chum salmon, O. keta, Minter Creek was selected as an experimental stream. It is a typical small lowland stream of western Washington feeding

into Puget Sound. In addition to the 2 species of salmon, it contains natural populations of steelhead trout, Salmo gairdneri, cutthroat trout, S. clarki, Cottidae, and lampreys. A hatchery was constructed on the stream and a weir capable of trapping all up- and downstream migrants was placed across its mouth. The weir made it possible to control the numbers of fish spawning naturally above it; the excess were spawned artificially in the hatchery. Groups of fish were distinguished by removing various fins. Data for the years 1937 through 1956 are included in this report. Silver salmon are anadromous, the upstream migration occurring in the fall or winter. The young generally remain in fresh water until May of the year after hatching and return to spawn at 3 years of age. Some young fish may remain in fresh water 2 years and some may mature at 2 or 4 years of age. Since construction of the weir, downstream migrations have included as many as 177, 269 hatchery fish and 41, 848 wild fish in a single year. Returns of mature fish have contained up to 3746 hatchery fish and 3767 wild fish. Both up- and downstream migrations are profoundly influenced by rainfall. Fecundities have ranged from 1900 to 3286. Survivals of eggs and young fish in the hatchery to 12 months have been about 60%. Stream survivals of hatchery fish released above the weir after various periods of hatchery rearing have been as follows: 2.5-4 months, 10%; 6 months, 20%; 8 or 9 months, 40%; 12 months, 70%; 14 months, 87%. Marine survivals of marked hatchery fish have been as follows: 2.5-4 months of rearing, 1.06 to 8.33%; 6 to 9 months, 3%; 12 months, 0.06 to 2.67%; 14-months, less than 1%. Contributions of Minter Creek fish to the commercial and sport fisheries in 1940 and 1953 were calculated by recovery of marked fish in the fisheries in those years. It is estimated that the catch to escapement ratio is in the neighborhood of 2:1. A detailed study of the 1950 brood releases shows that 98.7% of the eggs taken were lost to natural mortality, 0.9% were fishing mortalities, and 0.4% returned to Minter Creek as adults. Total survivals from downstream migration to upstream migration of marked hatchery fish after various periods of rearing have been as follows: 3 months, less than 0.5%; 6 months, 0.6%; 8 or 9 months, 1.3 to 1.9%; 12 months, 1.1%; 14 months less than 0.8%. Corresponding grand total survival (egg to adult) figures also show highest survivals for fish reared 9 to 12 months. Escapements of 98 to 1393 females, with equivalent numbers of males, have been allowed above the weir for natural spawning. The stream has been demonstrated to have a capacity of about 25, 000 to 35, 000 yearlings above the weir. Fresh-water survivals from these escapements have been as follows: 100 females, 9.58 and 9.65%; 500 females, 1.62 to 3.81%; 1000 females, 0.70 to 1.70%. Marine survivals of marked fish have varied from 0.91 to 5.23%. There is a possible tendency for higher marine survivals to be associated with greater escapements. The optimum escapement, yield, and catch to escapement ratio of Minter Creek can be determined by comparing production arising from various escapements and catch to escapement ratios. When the marine survival is assumed to be a constant figure of 3% with varying escapements, these figures are 400 fish, 2300 fish, and 6:1 respectively. When the marine survival is assumed to increase with increasing escapement, the figures are 600 fish, 1100 fish and 2:1 respectively. Minter Creek hatchery has a capacity of 450, 000 yearling silver salmon, which can be produced by 300 females. These 450, 000 yearlings in turn would produce about 15, 750 adults. At present fishing rates about 5250 of these would return to the hatchery. The excess eggs and fry produced by these fish beyond the capacity for holding at the hatchery could be transferred to other hatcheries or planted into other streams. The above 300 females, if allowed to spawn naturally, would produce only about 2250 fish, of which about 750 would return to Minter Creek. The maximum natural production from Minter Creek can be realized with about 300 female spawners and an equivalent number of males. It is therefore recommended that this number of fish be allowed to spawn naturally and the remainder taken into the hatchery for artificial propagation. (W.H.B.)

2053. Jónasson, Pétur M. 1955. THE EFFICIENCY OF SIEVING TECHNIQUES FOR SAMPLING FRESHWATER BOTTOM FAUNA. Oikos, Vol. 6, No. 2, pp. 183-207; Biol. Absts., Vol. 32, No. 9, Abst. No. 29263. 1958.

An investigation of the correlation between the number of individuals captured and the mesh gauge. The most commonly used mesh gauge is 0.6 mm. This mesh gauge is found to be inefficient as chironomid larvae of up to 10 mm length can pass through. A sieve is described with exchangeable gauze of mesh gauges 0.20, 0.26, 0.51 and 0.6 mm. When the small mesh gauges are employed it is possible to increase the total number of individuals captured between June and December by 100-600% over the numbers captured by the 0.6-mm sieve. The use of a suitable mesh gauge will lead to altered conclusions within this field both in quantitative and qualitative respects. The question of seasonal variation and migrations of species and previous explanations of their causes must be revised on this basis also. (Auth. summ.)

2054. Tambs-Lyche, Hans. 1956. A SIMPLE METHOD FOR QUANTITATIVE DETERMINATION OF H_2S IN SEA WATER. Univ. Bergen Arbok, Natur v. rekke, 1956, No. 12, pp. 1-5; Biol. Absts., Vol. 32, No. 9, Abst. No. 29270. 1958.

A method is described which can be used on board small research vessels. Calibrated syringe pipettes are used.

2055. Kusa, Mamoru. 1957. OCCURRENCE OF A NEUTRAL POLYSACCHARIDE IN THE CORTICAL ALVEOLI OF THE LAMPREY EGGS. Jour. Fac. Sci. Hokkaido Univ. VI. Ser. Zool., Vol. 13, No. 1/4, pp. 455-457; Biol. Absts., Vol. 32, No. 9, Abst. No. 29384. 1958.

In the eggs of Lampetra ressnei and L. japonica japonica, the cortical alveoli are all positive to the Hotchkiss-McManus, the Bauer and the Monne and Slautterback cytochemical tests, but resistant to amylase and unstainable with iodine; they show no essential protein reaction. These alveoli have little affinity for such basic dyes as safranin O and neutral red, and give no metachromasia with toluidine blue. Judging from these results, the material contained is regarded as a neutral mucopolysaccharide. (Y. W.)

2056. Yamamoto, Kiichiro. 1956. STUDIES ON THE FORMATION OF FISH EGGS. IV. THE CHEMICAL NATURE AND THE ORIGIN OF THE YOLK VESICLES IN THE OOCYTES OF THE FLOUNDER, LIOPSETTA OBSCURA. Japanese Jour. Zool., Vol. 11, No. 5, pp. 567-577; Biol. Abstr., Vol. 32, No. 9, Abst. No. 29411. 1958.

The yolk vesicles in the early oocytes are very similar cytochemically to Parat's neutral red vacuoles, and rich in polysaccharide, but possess no appreciable amount of proteins or lipids. Probably their formation depends, not upon the mitochondria, but very greatly upon the argentophilic bodies (with the Da-Fano technique). The minute mitochondria, however, do appear to give rise to the primary yolk granules. (Y. W.)

2057. Yamamoto, Kiichiro. 1956. STUDIES ON THE FORMATION OF FISH EGGS. VII. THE FATE OF THE YOLK VESICLES IN THE OOCYTES OF THE HERRING, CLUPEA PALLASII, DURING VITELLOGENESIS. Annot. Zool. Japon., Vol. 29, No. 2, pp. 91-96; Biol. Abstr., Vol. 32, No. 9, Abst. No. 29412. 1958.

The yolk vesicles appear to originate in argentophilic bodies, and to shift to the peripheral cytoplasm to give rise to the cortical alveoli, while the yolk globules seem to be of mitochondrial origin and retain their position in the extra-vesicular cytoplasm. Neutral mucopolysaccharide occurs in the yolk vesicle at the yolk vesicle stage and thereafter. (Y. W.)

2058. Nikonorov, I. V. 1956. OBSERVATIONS ON THE BEHAVIOR OF THE CASPIAN SPRAT. (NABLYUDENIYA ZA POVEDENIEM KASPYSKIKH KILEK.) Voprosy Ikhtiol., 1956, No. 6, pp. 21-36; Biol. Abstr., Vol. 32, No. 9, Abst. No. 29505. 1958.

Behavior of sprats was studied to perfect methods of catching them by use of light. The sprat appears in a lighted zone for several seconds from the moment of illumination and approaches fairly close to the light source. The school of sprats has a cylindrical form; the fish remain in a dense, mobile mass, recalling a swarm of insects around a light. Sprats assemble principally above the light source. A survey is made of reasons why so few are caught in enclosed spaces, and also in suction devices. To get high catches of fish with the suction device (at any concentration or distribution of sprats in the lighted area) the radius of action of the suction device must be enlarged. A study was made of behavior of sprats in the zone of action of an electric current. At a water temperature of 20 to 25° C and in an electric field of less than 0.3 volts/cm, sprats reacted weakly to the electric current; they were mobile, and concentrated in corners of the aquarium. Raising the EMF to 0.3 to 0.5 volts/cm paralyzed them. When the water temperature was 9 to 10°C the sprats under the action of the current went to the anode more quickly than at higher temperatures. When the polarity of the electrodes was changed the fish again went to the anode. An increase in EMF at this temperature also caused paralysis. If the sprat does not enter an even field of electricity at once, it then swims away from it. Sprats do not react visibly to the sound given by a bell submerged in the water.

2059. Privol'nev, T. I. 1956. THE REACTION OF FISH TO LIGHT. (REAKTSIYA RYB NA TSVET.) Voprosy Ikhtiol., 1956, No. 6, pp. 3-20; Biol. Abstr., Vol. 32, No. 9, Abst. No. 29506. 1958. (Translation)

The ability to discriminate among light, darkness, and different portions of the spectrum was determined under experimental conditions in whitefish, herring, perch, the young of carp and rainbow trout, and also in bream and perch in the early stages of development (about 40 days after hatching). Whitefish have no sharply expressed discrimination of any particular color, but are capable of manifesting a weak negative reaction to red light and the same degree of positive reaction to green light and to ordinary electric light. In herrings in the fall (Sept.) there is a well-expressed positive reaction to light, but in winter (Feb.) it is negative, when the young fish tend to keep in the dark portions of the aquarium. In the spring the reaction becomes positive and remains so for the course of the entire year. The nature of reaction of herrings to light is determined by the degree of illumination of the place where they have been: fish which have been in the dark for a long time flee from the light. Experiments with perch carried out at the beginning of June at a water temperature of 18 to 20°C showed that in adult fish there is a clearly expressed negative reaction to light (93.3% of the fishes kept to the darkened area of the apparatus), but there is a positive reaction in perch fry. In the young of the crucian carp there is a clear negative reaction to light. In winter young carp are indifferent to light. In young rainbow trout in winter there was a weakly positive reaction to light. In eels there was a clearly expressed negative reaction to light. In spry of the bream up to 20 days of age there was a clearly expressed positive reaction to light, which became negative at later stages of development. Qualitative and quantitative characteristics of reactions of some fishes to light are given.

2060. Radakov, D. V. 1956. A STUDY OF THE BEHAVIOR OF FISH DURING CATCHING. (IZUCHENIE POVEDENIYA RYB VO VREMYA LOVA.) Voprosy Ikhtiol., 1956, No. 6, pp. 37-46; Biol.

Absts., Vol. 32, No. 9, Abst. No. 29507. 1958. (Translation)

Chiefly on the basis of data in the literature, the behavior of fish during catching is described, as well as a trial of various instruments of the catch.

2061. Tsivoglou, E. C., and W. W. Towne. 1957. SOURCES AND CONTROL OF RADIOACTIVE WATER POLLUTANTS. Sewage and Indust. Wastes, Vol. 29, No. 2, pp. 143-156; Biol. Absts., Vol. 32, No. 9, Abst. No. 29566. 1958.

A number of phases of the water pollution problem associated with the production and use of radioactive substances are discussed. The extent of uranium ore refining is indicated and the naturally occurring decay products of U^{238} including radium are mentioned as hazards. Attention is called to nuclear reactor cooling water as a potential source of contamination due to energy absorption by impurities present in the water. The ability of aquatic forms to concentrate radiophosphorus at levels 100,000 times higher than those occurring in the Columbia River, as well as the ability of plants receiving contaminated irrigation water to concentrate radioiodine and radiostrontium are mentioned. Control of radioactive water pollution is considered dependent on basin-wide planning requiring complete knowledge of existing and planned use of radioactive materials. Monitoring programs involving water, mud and silt, and aquatic life sampling are essential for such control efforts. Examples of such programs are those conducted on the Ohio River by Orsan-Company and along the Cheyenne River by the South Dakota State Health Department. Sources of information concerning maximum allowable exposure levels are given, and their tentative nature is emphasized. (I.G.)

2062. Jones, B. F., C. E. Warren, C. E. Bond, and P. Doudoroff. 1956. AVOIDANCE REACTIONS OF SALMONOID FISHES TO PULP MILL EFFLUENTS. Sewage and Indust. Wastes, Vol. 28, No. 11, pp. 1403-1413; Biol. Absts., Vol. 32, No. 9, Abst. No. 29571. 1958.

Avoidance reactions of juvenile chinook and coho salmon to kraft and sulfite process effluents, and of steelhead trout to kraft effluent were studied. Modified gradient and partitioned parallel channel tanks were employed. When varying the kraft effluent concentration from 0 to 4.8% by volume, chinook salmon showed marked avoidance, coho salmon showed less, and steelheads showed no observable avoidance of any kraft effluent concentrations. Using parallel channel tanks, chinooks avoided 10% kraft effluent, and cohos showed little or no avoidance at 2.5 to 5%. Using spent sulfite liquor in similar apparatus, chinooks demonstrated marked avoidance of 2000 ppm 10% liquor, tapering off gradually to only slight avoidance at 125 ppm. Again coho salmon showed little or no avoidance at 1000 to 2000 ppm. The above studies were directed at demonstrating ability for instantaneous avoidance. It cannot be assumed that delayed avoidance might not be shown in experiments of longer duration. (I.G.)

2063. Zaitsev, Y. P. 1955. THE EFFECT OF THE SALINITY OF THE WATER ON THE DEVELOPMENT OF THE ROE OF THE FLOUNDER PLEURONECTES FLESUS LUSCUS PALLAS. (VLIYANIE SOLENOSTI VODY NA RAZVITIE IKRY KAMBALY-GLOSSY PLEURONECTES FLESUS LUSCUS PALLAS.) Doklady Akad. Nauk SSSR, Vol. 105, No. 6, pp. 1364-1367; Biol. Absts., Vol. 32, No. 9, Abst. No. 29575. 1958. (Translation)

Under the influence of the increased salinity of the water of the Khadzhibeevsk estuary (31.55 per mille), the roe of the Black-Sea flounder there has acquired certain special features distinguishing it from the roe of the same flounder in the Black Sea: the roe has become smaller and its specific gravity has increased. The acquired characteristics are important to the extent that the roe of the Khadzibeevsk estuary flounder cannot develop normally in the waters of the Black Sea. Incubating this roe in water with a salinity of 60.25 to 4.14 per mille showed that the most favorable environment for its development is 31.55 per mille; at a salinity of 18.10 per mille the loss was 95%.

2064. Szarski, H., E. Delewska, S. Leja, S. Olechnowiczowa, A. Predygier, and L. Slankowa. 1956. THE DIGESTIVE SYSTEM OF THE BREAM (ABRAMIS BRAMA L.). (UKŁAD TRAWIENNY LESZCZA (ABRAMIS BRAMA L.).) (In Polish with English summ.) Studia Soc. Sci. Torunensis. Sect. E., Vol. 3, No. 7, pp. 113-146; Biol. Absts., Vol. 32, No. 9, Abst. No. 30033. 1958.

The alimentary tract of the bream is comparatively short. The mucous membrane of the alimentary canal forms a net of anastomosing folds. These do not disappear even after a forced distention of the intestine. Narrow but profound diverticles are situated between the folds. The depth of the diverticles is greatest in the anterior part of the intestine, and is dependent upon the dimensions of the fish. Parallel with fish growth the depth of the diverticles goes on increasing, and consequently the ratio of the absorptive area of the body weight must be kept nearly constant. Evidence is presented suggesting that the absence of the stomach in various groups of fishes is a result of adaptation to the ingestion of sedentary organisms, usually covered with calcareous shells. (H.S.)

2065. Kryzhanovsky, S. G. 1955. FEATURES OF THE SEXUAL PRODUCTS OF THE SAKHALIN HERRING CLUPEA HARENGUS PALLASI VAL. (OSOBENNOSTI POLOVYKH PRODUKTOV SAKHALINSKOI SEL'DI CLUPEA HARENGUS PALLASI VAL.) Voprosy Ikhtiol., 1955, No. 5, pp. 34-38; Biol. Absts., Vol. 32, No. 9, Abst. No. 30288. 1958.

One of the features of the spawning of herring is the high concentration of producers ejecting a mass of sexual products in comparatively limited

regions. The successful fertilization of roe is favored by the high concentration of milt and the special properties of the sperm of the herring. Falling into the water, the spermatozoa of the herring preserve the capacity for fertilization for a relatively long time; thus, within 7 hours, almost all the ripe roe are fertilized by these sperms, 62.2% within 25 hours; only after 48 hours or several hours earlier is the sperms' capacity for fertilization completely lost. The spermatozoa of the herring are characterized by low motility, ceasing within a few minutes after hitting the water. However, their fertilizing capacity remains, and 99% of eggs fertilized by non-motile sperms develop. From eggs placed in uncontaminated water, only 6.3% developed parthenogenetically. Herring eggs, cast into water, keep their fertility for a relatively long time (about 7 hours). Partly for that reason, the number of non-fertilized eggs in natural layings is relatively low (0.6-3%). The negative influence of non-fertilized eggs on the growth of the herring in layings is also eliminated by their capacity for parthenogenesis. The number of parthenogenetically developing eggs in various females ranges from 0 to 90%; in 43% of the females studied, the roe as a whole did not possess the capacity for parthenogenesis. Females with eggs capable of parthenogenesis are found at the end of the spawning period, possibly a result of over-ripening. The sure development of roe in a very concentrated laying is also guaranteed by the fact that the non-fertilized eggs and those incapable of parthenogenesis may live in water a rather long time (10-15 days); furthermore, if they perish, they do not impede the emergence of larvae, because of the low temperature of the surrounding environment. Roe are well-preserved in the body of the dead female: at a temperature of 7°, a half-hour after its death, 1% of the eggs may be fertilized, and of the remaining non-fertilized eggs, 90% are capable of parthenogenesis; within an hour only 7% can develop parthenogenetically, and within 2-3 hours this capacity is completely lost. The fertilizability of roe is retained at the high initial level for 8 hours after the death of the female; within 11 hours, 15-39% can be fertilized; shortly after this all the eggs lose their fertilizability.

2066. Prazdnikove, N. V. 1955. FOOD-MOTOR REFLEXES TO CHAIN STIMULI IN FISH. (PISHCHEVYE DVIGATEL'NYE USLOVNYE REFLEKSY NA TSEPI RAZDRAZHITELEI U RYB.) Zhur. Vyssh. Nervn. Deyatelnosti, Vol. 5, No. 6, pp. 901-911; Biol. Absts., Vol. 32, No. 9, Abst. No. 30486. 1958. (Translation)

Positive and negative time reactions to 3-membered chain stimuli were evoked in 6 crucian carp by the food-obtaining procedure. The positive conditioned reflex occurred after 5-15 applications of the conditioned stimulus. A stable differentiator could be developed after 150-200 applications only to the chain of stimuli with the reverse sequence of the components. A differentiator to a chain of stimuli with a change in the middle member was also formed, but it was very unstable. It was possible to induce a single alteration of the signal significance of the positive and the differential chains. According to the degree of reinforcement of the conditioned reflex by the chain of stimuli, the individual components lose their signal significance and the fish reacts to the chain as to a single stimulus.

2067. Kryzhanovsky, S. G. 1956. THE GROWTH OF THE SPRAT IN WATER OF INCREASED SALINITY. (RAZVITIE SALAKI V VODE POVYSHENNOI SOLENOSTI.) Voprosy Ikhtiol., 1956, No. 6, pp. 100-104; Biol. Absts., Vol. 32, No. 9, Abst. No. 30868. 1958. (Translation)

In connection with discussions concerning the suitability of acclimatization of the sprat in the White Sea, experiments were carried out to clarify the possibility of fertilization and development of the roe of this fish in White Sea water with a salt concentration of 25%. Fertilization of the roe, formation of the morula and blastula occur almost as in distilled water. An abnormal form has only yolk, clumps of which acquire an angular form. In the stage of the 20th-22d segments the yolk sac has a knobby surface, the Kupfer vacuoles are markedly increased. Segmentation of the body is completed at the same time in embryos developing in salt and distilled water, but the former have a higher pulse rate. In salt water, arrest of the heart and necrosis of parts of the yolk sac are observed in 3-day embryos. In 5-day embryos hatching out of the case, the foci of necrosis are larger; these embryos have a series of malformations; the body and tail are bent sidewise and downwards, the liver is shortened, the intestine is extended behind the liver; all the embryos have an abnormal auditory capsule: a bulge in the region of the endolymphatic canal and a disturbance of the development of the semicircular canals. All the embryos which had developed in salt water died before hatching out of the case. The distortion, sideways and downwards, of the body cannot be considered a malformation caused by the salinity of the water: it is also observed from time to time during development in fresh water. All the rest of the malformations are specific developmental deviations dependent on the influence of increased salinity. In roe developing in distilled water and transferred to water with a salinity of 25%, before the beginning of segmentation of the embryo, the yolk sac remained free from protuberances. In the later stages it became turbid in many of the roe and these roe perished. In hatching embryos the tail end of the body bends upward and the segments of the chord in the anterior section of the body are enlarged, but in the posterior section they are diminished. Indications were also noted of further abnormality in the function of the heart, structure of the liver, intestines, and auditory capsule. Therefore, the sprat cannot be introduced into the White Sea, if its roe would be subjected to the effect of a salinity of 25%.

2068. Lozinov, A. B. 1956. THE OXYGEN OPTIMUM OF STURGEON YOUNG. (O KISLOROD-

OPTIMUME MOLODI OSETROVYKH.) Doklady Akad. Nauk SSSR, Vol. 107, No. 2, pp. 337-339. Biol. Absts., Vol. 32, No. 9, Abst. No. 30869. 1958. (Translation)

Experiments showed that with a rapid reduction of O_2 content in the water, the gaseous exchange of the fry and young of the sturgeon (Acipenser güldenstädti and A. stellatus) was maintained at a constant level up to a certain limit. A fall in the O_2 content to below 3 mg/l led to a sharp reduction in gas exchange. With a slow reduction of the O_2 content and subsequent long-term maintenance of fish in conditions of O_2 concentration below the indicated limit, gas exchange was established at a still lower level. Growth tempo, food consumption, and food coefficient were also essentially unchanged only up to a certain limit (higher than the limit for gas exchange); below this, a sharp drop in growth and nutrition and a rise in the food coefficient occurred. In the optimal O_2 zone (at 18°, above 5.0-5.5 mg O_2/l) a change in the O_2 content in the water does not affect the young of these sturgeon. The young easily adjust to an O_2 deficit below the indicated limit; moreover, the greater the O_2 deficiency, the more markedly reduced are the metabolic processes. In long-term residence in conditions of great O_2 deficiency, adaptation of the young fish occurs by a lowering of the intensity of respiration and qualitative shifts in metabolism; this may be judged from the respiratory coefficient up to 1.0 and even up to 1.1-1.2.

2069. Bursche, E. 1957. THE MACROPHYTIC VEGETATION OF THURINGIAN PONDS AND THEIR EVALUATION FOR FISHERIES. LitBer. Wass. Abwass. Luft u. Boden, 1957, No. 6, pp. 112-113; Water Pollution Abstracts, Vol. 31, No. 7, Abst. No. 1376. 1958.

The higher water plants are little used in the assessment of water quality. The author investigated 48 carp ponds in Thuringia with special reference to the macro vegetation and their assessment as fishing waters. The occurrence, distribution, and composition of communities of macrophytes gave valuable information for the assessment of the fishing value of the waters. Methods of sampling are described. Illustrations of characteristic ponds, lists of plants, and chemical data are given.

2070. Tully, J. P., and A. J. Dodimead. 1957. CANADIAN OCEANOGRAPHIC RESEARCH IN THE NORTH PACIFIC OCEAN. Fisheries Research Board of Canada, Pacific Oceanographic Group, Nanaimo, B.C., 1957, 30 pp.; Water Pollution Abstracts, Vol. 31, No. 7, Abst. No. 1380. 1958.

From several surveys made in the northeast Pacific Ocean in 1955 and 1956, it has been possible to make a preliminary assessment of some of the principal features of the oceanography of the area. Further data on winter conditions are still required. The data obtained are discussed under the headings of temperature, salinity, and water masses, and illustrated in appended figures.

2071. Henderson, C., and C. M. Tarzwell. 1957. BIO-ASSAYS FOR CONTROL OF INDUSTRIAL EFFLUENTS. Sewage industr. Wastes, 1957, 29, pp. 1002-1017; Water Pollution Abstracts, Vol. 31, No. 9, Abst. No. 1851. 1958.

The value of bio-assays for determining the toxicity of trade waste waters is discussed, and the importance of taking into account factors which may affect the toxicity is stressed. The choice of test fish and dilution water, and the layout of the test laboratory are described, and procedure for sampling the waste water and carrying out the tests is outlined. The computation and application of the results are discussed, and some examples of the use of bio-assays by specific industries are included.

2072. Cox, R. A. 1957. AN IMPROVED SALINITY AND DENSITY METER. J. Cons. int. Explor. Mer, 1957, No. 23, pp. 38-46; Water Pollution Abstracts, Vol. 31, No. 7, Abst. No. 1392. 1958.

Improvements have been made to the float-type salinity meter previously described. The all-glass float has been replaced by one incorporating metal springs, and the mechanical design has been modified to increase the speed of operation. The precision of the apparatus is still approximately equal to that of the standard chemical method. Details and dimensions are given for the construction of floats to cover any desired range of salinity, and for computing the necessary scales. An artificial density standard, suitable for approximate work, is described.

2073. Husmann, W. and G. Stracke. 1957. CONTINUOUS MEASUREMENT OF OXYGEN IN RIVER WATER AND SEWAGE. Wasserwirtschaft, Stuttgard, 1957, No. 48, pp. 13-14; Water Pollution Abstracts, Vol. 31, No. 7, Abst. No. 1394. 1958.

The authors give illustrations of two forms of apparatus for the electrochemical determination and recording of oxygen, the first being a flow-through apparatus and the second for use either as a flow-through or a submerged apparatus. Results of use of the second form in an activated-sludge tank are described.

2074. Doret, A. M. 1956. LEGAL PRINCIPLES OF PROTECTION OF WATERS AGAINST POLLUTION. Technikbeil. Neu. Zürich. Z., Nov. 1, 1956; Water Pollution Abstracts, Vol. 31, No. 7, Abst. No. 1464. 1958.

An account is given of the history, general provisions, and progress of the new Swiss law for prevention of water pollution.

2075. Lüdemann, D. 1957. THE EFFECT OF THE DYESTUFF "LUXANTHOLSCHWARZ G" ON FISH. A CONTRIBUTION TO THE HARMFULNESS OF COLOURED WASTE WATERS. Z. angew. Zool., 1957, No. 44, pp. 97-102; Water Pollution Abstracts, Vol. 31, No. 7, Abst. No. 1474. 1958.

Tests of the toxicity of the dye "Luxantholschwarz G" showed that small guppies were harmed at a concentration of 5 mg per litre while with a small species of carp the first damage was noted at 75 mg per litre.

Damage was mainly to the gills which were choked with fine particles of dye. Indirect damage may be caused by the black dye cutting off light, so that plant growth and development of organisms are hindered.

2076. Berger, B. B. 1958. PHS STUDIES ON THE USE OF HEXADECANOL IN RESERVOIR EVAPORATION REDUCTION. Sthwest Wat. Wks. J., 39, No. 12, 22...26; Water Pollution Abstracts, Vol. 31, No. 8, Abst. No. 1488. 1958.

In a paper presented at the Southwest Section, American Water Works Association Convention held at Oklahoma City, Okla., October 1957, the author described laboratory studies carried out by the Public Health Service on the use of hexadecanol for reducing evaporation in reservoirs. He discussed the human toxicity potential of hexadecanol, its effect on fish, on water treatment processes and on recreational use of water and its resistance to biological attack. It is concluded from these laboratory studies that hexadecanol poses no direct problem as regards fish toxicity and that the proposed application will produce no noticeable effect on water treatment processes. Microbiological attack could produce loss of hexadecanol and reduce film spreading and may consequently affect its use economically. Final conclusions must necessarily be based on full field studies.

2077. Newell, B. S. 1957. THE NOCTURNAL REDUCTION OF DISSOLVED OXYGEN IN DAMS. E. Afr. agric. J., 1957, 23, pp. 127-129; Water Pollution Abstracts, Vol. 31, No. 8, Abst. No. 1572. 1958.

A study of a dam near Jinja, Uganda, has shown that, in addition to diurnal fluctuation of the oxygen concentration as a result of photosynthesis and respiration, nocturnal cooling of the surface water can cause overturn of the water column, thus depleting the surface water of oxygen.

2078. Huet, M. 1956. OUTLINE OF PISCICULTURE IN INDONESIA. Trav. Sta. Rech. Groenendaal, Ser. D, No. 19, 56 pp.; Water Pollution Abstracts, Vol. 31, No. 8, Abst. No. 1573. 1958.

A summary is given of the results of observations made in Indonesia during 1955 concerning the pisciculture of brackish-water ponds, called "tambaks", of freshwater ponds, and of paddy fields. The biology and cultivation of Chanos chanos (milkfish), which is the principal fish in the tambaks, is discussed, including its relation to the growth of algae; Tilapia mossambica, Puntius javanicus, and shrimps also grow in the tambaks. The characteristics of the freshwater fisheries are described with reference to the principal species produced, namely (in order of importance) Cyprinus carpio (carp), Tilapia mossambica, Puntius javanicus, Helostoma temmincki, Osteochilus hasselti, Osphronemus goramy, and Trichogaster pectoralis. The importance of pisciculture in the rice fields is emphasized, the fish cultivated being chiefly carp, and also Tilapia mossambica, Osteochilus hasselti, and Puntius javanicus. Methods of culturing the fish, both in the interval between two rice crops, and simultaneously with the rice, are described. The methods of production of fish in Indonesia could possibly be adopted in other tropical countries to enrich diets which are deficient in animal protein.

2079. Timmermans, J. A. 1956. TWO SIMPLE AND USEFUL DEVICES IN PISCICULTURE. Trav. Sta. Rech. Groenendaal, Ser. D, No. 20, 6 pp.; Water Pollution Abstracts, Vol. 31, No. 8, Abst. No. 1574. 1958.

In connection with studies on the natural growth and artificial feeding of carp, an apparatus was designed for measuring the distribution of carp fry in the breeding ponds. It consists of a rectangular wooden tank which can be divided into 10 equal sections by 9 galvanized iron plates sliding in vertical grooves and fitting into grooves at the bottom. Taps are provided at opposite corners of the tank. Counting is carried out by pouring the fry into the tank, stirring by hand to make the distribution homogeneous, immediately lowering the plates into the bottom grooves, and removing the contents of the end compartment through the tap into a vessel of water; the number of fish in the one compartment can then be counted directly, or if there are too many the contents are passed to a second tank similar to but smaller than the first and a representative fraction is similarly obtained for counting. The individual compartments of the first tank can be emptied in turn by raising the movable plates. A second piece of apparatus was developed from the wooden tray used in the artificial feeding of the carp; the tray was converted into a trap by means of framework, part of which supports a net which can be pulled into place to entrap the fish while they are feeding.

2080. McCracken, L. H. 1956. A SIMPLE TECHNIQUE FOR SEALING SEA-WATER SAMPLES. Fisheries Research Board of Canada, Pacific Oceanographic Group, Nanaimo, B. C., 1956, 6 pp.; Water Pollution Abstracts, Vol. 31, No. 8, Abst. No. 1578. 1958.

During oceanographic surveys, samples of sea water collected for analysis, particularly for determination of salinity, often have to be stored for some time before the analyses can be carried out, and it is important that there should be no change in concentration as a result of evaporation. It has been found that a standard flat 8-ounce medicine bottle is the most satisfactory for collecting, shipping, and storing. Evaporation is prevented if the cork is waxed, and if a further seal is applied by dipping the neck of the bottle in melted paraffin wax. Samples sealed by this method and stored for up to 2 years gave consistent results with a variation in salinity of only ± 0.02 per thousand.

2081. Tabata, S. 1956. CLASSIFICATION OF DAILY SEA-WATER DATA. Fisheries Research Board of Canada, Pacific Oceanographic Group, Nanaimo, B. C., 1956. 17 pp.; Water Pollution

Abstracts, Vol. 31, No. 8, Abst. No. 1579. 1958.

A method is described for classifying the daily observations of temperature and salinity of the sea water at the 5 light-stations along the coast of British Columbia. In order to summarize the large masses of data collected during the 15 years from 1940 to 1954, the monthly means are compared to the grand monthly means by passing them through a step filter whose jumps are chosen from integral multiples of the standard deviations. Examples of the use of this classification are shown.

2082. Maloney, T. E. CONTROL OF ALGAE WITH CHLOROPHENYL DIMETHYL UREA. Amer. Wat. Wks Ass., 1958, 50, pp. 416-422; Water Pollution Abstracts, Vol. 31, No. 8, Abst. No. 1663. 1958.

In preliminary screening tests, chlorophenyl dimethyl urea (CMU) in a concentration of 2 p. p. m. displayed good algicidal properties against 6 representative species of algae, but was not toxic to fish. Full-scale laboratory and field tests have since been carried out. In the laboratory tests, 14 concentrations of CMU, ranging from 0. 004 to 32. 0 p. p. m. were used against 33 species of algae including blue-green and green algae and diatoms. The growth of all the blue-green algae and diatoms and of 65 per cent of the green algae was prevented by 2 p. p. m. CMU. The algicide is not toxic to fish and other aquatic animals at this concentration, and is 5 times less toxic to humans than 2, 4-D. The field tests were carried out at the Ohio State Fish Hatchery at Newtown, in 3 ponds of different sizes, which were sprayed with a solution of CMU. Good results were obtained in the destruction or prevention of filamentous algal growths which blanket ponds and lakes, and attach themselves to the walls of reservoirs. Spraying the bottom and sides of a pond with CMU before filling it with water was particularly effective in preventing the growth of algae. CMU is therefore promising as an algicide; care is, however, required in the application of this compound, since misapplication could destroy valuable vegetation. Before using CMU as an algicide, the permeability of the soil at the bottom and sides of the water area, the drainage of the general area, and the future use of the treated water should be considered.

2083. Anonymous. 1957. WHIPPING IT UP. Industr. Engng Chem., 1957, 49, No. 11, 34A, and 37A; Water Pollution Abstracts, Vol. 31, No. 8, Abst. No. 1665. 1958.

Experiments are being carried out by the Sulphite Pulp Manufacturers' Research League at some pulp mills in Wisconsin, on the use of hydroelectric turbines to aerate streams polluted with sulphite cellulose waste waters. It is thought that aeration will make it possible to maintain a concentration of dissolved oxygen of 3 p. p. m., the level required for survival of game fish. Studies are still to be made on whether the introduction of air into the turbines will have a harmful effect on them.

2084. Wurtz, A. 1956. FUNGI, BACTERIA AND ALGAE IN POLLUTED WATERS. Bull. franc. Piscic., 1956, No. 182, 5-25 and 1957, No. 184, 89-116; Water Pollution Abstracts, Vol. 31, No. 8, Abst. No. 1664.

The biological examination of polluted waters to determine the extent of pollution and hence the effect on fish is discussed, with special reference to the pollution caused by milk processing plants, which encourages extensive growth of Leptomitus lacteus, and by sugar refineries and distilleries, which is characterized by the growth of Sphaerotilus natans; if the water is not heavily polluted this organism may also exist in another physiological form known as Cladothrix dichotoma. At the beginning of the sugar season the effluent from the factory causes abundant growth of Sphaerotilus; towards the end of the season, however, the Cladothrix form appears. Detailed examination of the form in which this organism occurs indicates the extent of the pollution. Yeasts also grow in waste waters, especially those containing sugars, as from paper, cellulose, starch, and sauerkraut manufacture, but the growth is not usually apparent since the organisms are unicellular. The species Endoblastoderma and Torula can be used in the treatment of waste waters which are rich in sugars, to reduce the danger of pollution and to yield a by-product known as "tourteaux" and useful as animal feeding-stuff or even as food for human beings. The distinctions previously made between true and false Ferrobacteria are no longer held; the different forms, which may occur for example in rivers polluted by sugar waste waters, are capable of mutual transformation. The presence of Sphaerotilus as an index of organic pollution is discussed; the substances responsible for the development of this organism are listed; and rules are given for the macroscopic distinction between Leptomitus and Sphaerotilus.

2085. Nazarenko, I. V. 1958. HYGIENIC EVALUATION OF FORMALDEHYDE AS A FACTOR OF POLLUTION OF RESERVOIRS. Hyg. & Sanit., Moscow, Vol. 23, No. 1, pp. 3-10 (English summary); Water Pollution Abstracts, Vol. 31, No. 8, Abst. No. 1666. 1958.

The effect of formaldehyde on the hygienic and organoleptic quality of water in reservoirs and on warm-blooded animals has been investigated. The results are shown diagrammatically and in tables, and on the basis of these observations it is recommended that the maximum permissible concentration of formaldelyde in the water should be fixed at 0. 5 mg per litre.

2086. Anonymous. 1958, DIRECTING YOUNG SALMON. Nature, Vol. 182, No. 4629, pp. 162-163.

Research on the methods of guiding young Pacific salmon while migrating downstream have recently been described by J. R. Brett and D. F. Alderdice in Fisheries Research Board of Canada, Bulletin No. 117: Research on Guiding Young Salmon at Two British Columbia Field Stations.

First experiments, in 1953, were performed in a large divided trough using captive sockeye yearlings. These were intended to survey broadly the possibilities of using various techniques, including light, sound, air bubbles, curtains of hanging chain, odours, dye releases and differences in water velocity as means of guiding young fish. Significant deflexion resulted from the use of a relatively large area of illumination at night, a band of rising air bubbles or bursts of dark dye during the day, and strands of chain hung vertically during both day and night.

Further trough experiments, in 1954, on the use of hanging chain demonstrated that the maximum distance between strands which produced a deflexion of 75 percent or more fish through an angle of 45° was 4 in. Apart from its light-reflecting quality, the type of chain was found to be unimportant. The sensory stimulus causing the avoiding reaction was found to be primarily visual. Slow oscillation of the chain increased the deflexion of sockeye. Coho yearlings were not significantly deflected.

In conjunction with the trough experiments, a limited number of field tests using a 56-ft. oscillating chain deflector, 144 oscillations a minute, in the Lakelse River, British Columbia, proved that the technique had promise for guiding a natural run of young sockeye. At right angles to the direction of water flow a maximum of 79 percent deflexion was achieved. However, the barrier was subject to considerable penetration if conditions were not ideal; coho were still not effectively deflected.

A number of modifications was introduced in the 1955 deflector. The chain was replaced by cables which were suspended from a continuous moving belt. The belt travelled across-stream, reversing at the entrance to the trap. Various intervals and rates of travel (to a maximum of 12 in./sec.) were tested. The combinations which proved most effective included an interval between strands of not more than 6 in., and rates of travel from 8 to 12 in./sec. In these circumstances an average of 92 percent of sockeye and 59 percent of coho were deflected.

In addition to changes in the deflector, a new opening or by-pass to the inclined-screen trap was built. The particular features of the by-pass were a reduction of visual cues in the entrance by using smooth, painted surfaces, a gradual acceleration of the incoming water to a velocity equal to or just exceeding the maximum swimming speed of the migrants, and the presence of cross-reflecting mirrors. Although the first model had limitations, it improved the trapping of deflected fish and permitted a good numerical assessment of the deflector.

Final tests were conducted in Hoolnose Creek during 1956. Pink, chum and coho fry, as well as sockeye and coho yearlings, migrate down this small stream. The same deflector was used, with additional features of smaller, weighted cables, a minimum interval of 2 in. between strands, low direct-current charging of the moving cables, and a 3-ft. wide sheet of metal on the stream bed, painted white to reflect light incident on the surface. The reduction in spacing was introduced to scale down the interval dimensions to a more appropriate size for fry. Also, by adding an electric charge, a combination of stimuli was presented which was thought would be more effective.

No success was obtained in guiding any of the fry. However, both coho and sockeye fingerlings were deflected at 95 percent level and higher.

The investigations showed that new methods must be sought for the guiding of salmon fry. For yearlings, a full-scale test is desirable under conditions which approximate to reservoir characteristics of large dams. (Author)

2087. Schmitz, William R., and Arthur D. Hasler. 1958. ARTIFICIALLY INDUCED CIRCULATION OF LAKES BY MEANS OF COMPRESSED AIR. Science, Vol. 128, No. 3331, pp. 1088-1089.

Turbulence induced by air bubbles causes circulation in small thermally stratified lakes. Tests were made under summer and winter (ice-cover) conditions. Homoiothermal conditions, isometric concentrations of phosphorus, and increases of dissolved oxygen were achieved, at various rates of treatment. The application of the technique for lake management and in studies of lake dynamics is suggested. (Auth. abst.)

2088. Robertson, O. H. 1958. ADRENAL HYPERCORTICALISM IN SPAWNING PACIFIC SALMON. Science, Vol. 128, No. 3332, pp. 1148-1149.

Death of all the Pacific salmon shortly after their first spawning presents a problem of unusual interest since this is an almost unique phenomenon among vertebrates (the phenomenon is unknown in mammals and is rare in fishes).

Histological studies of the various organs and tissues of the spawning salmon revealed markedly increased functional activity of the pituitary gland during the maturation of the gonads, followed at spawning by degeneration. At the same time the adrenal cortical tissue exhibited pronounced hyperplasia. Widespread atrophy and degeneration was found among other organs: stomach, liver, spleen, gonads, thyroid, and vascular system. Studies of the blood plasma revealed a high concentration of catabolic adrenal corticosteroids, 3 to 7 times that present normally in sea salmon. Associated with the increase in circulating adrenal steroids were hyperglycemia, lowered plasma proteins, reduced gamma globulin concentration, and disappearance of lymphocytes from the spleen. Such findings are consistent with adrenal hypercorticalism.

It has been possible to produce in immature rainbow trout, by means of hydrocortisone implanted in cholesterol pellets, almost all the degenerative changes characteristic of the spawning salmon. All the fish so treated died in 3 to 4 weeks. There are striking similarities between the clinical and pathological findings in the spawning salmon and Cushing's syndrome in man. (Auth. abst.)

2089. Iversen, Edwin S., and Earl E. Hoven. 1958. SOME TREMATODES OF FISHES FROM THE CENTRAL EQUATORIAL PACIFIC. Pacific Science, Vol. XII, No. 2, pp. 131-134.

Trematodes were collected in 1955 from marine fishes captured in the vicinity of the Line Islands during exploratory tuna fishing operations. All seven species are believed to constitute first records from this area, and some are first reports from new hosts. Host specificity as an indicator of geographic races of fish is discussed.

2090. Bennett, George W. 1958. AQUATIC BIOLOGY. Illinois Natural History Survey Bulletin, Vol. 27, Art. 2, pp. 163-178.

This is an historical account of the research in aquatic biology conducted by the staff of the Illinois State Laboratory of Natural History and later the Illinois Natural History Survey beginning with the work of Dr. Stephen A. Forbes in 1887.

2091. Tarzwell, C. M. 1958. DISPOSAL OF TOXIC WASTES. Industrial Wastes, Vol. 3, No. 2, pp. 48-52.

A review of work already done on bio-assay and its application in the disposal of toxic industrial wastes is presented. The need to consider the synergistic and antagonistic effects of toxicants and materials naturally present and the nature of the receiving water in establishing water quality standards makes the application of such standards to extensive areas or even to all parts of the same stream impracticable. Three main criteria which can be assigned numerical values that are applicable over extensive areas are those for temperature, D. O., and pH. The greatest weakness of bio-assay to date is its failure to take into consideration the long-time or chronic effect or the possible injury to aquatic life other than the test fish.

Bio-assays can be used to determine (i) industries contributing toxic wastes; (ii) the relative toxicity of different effluents and the total wastes from different plants; and (iii) the ability of a stream to assimilate the wastes of an industrial complex. They will, in addition, be of value in apportioning stream use equitably among the various industries according to the toxicity of their total waste and for detecting violations of regulations.

2092. Barber, F. G. 1958. ON THE DISSOLVED OXYGEN CONTENT OF THE WATERS OF THE HECATE REGION, B. C. Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 110, pp. 3-5.

Oxygen concentrations of less than 2 mg. /l., which is lethal to freshwater fish, have been observed in deeper waters of Queen Charlotte Sound. Certain bottom-feeding fishes are known to undergo seasonal depth migrations. While a number of factors are likely responsible, it is suggested that a variation of oxygen content from season to season may be of particular significance.

2093. Waldichuk, Michael. 1958. SUMMER OCEANOGRAPHY IN OSBORN BAY, B. C. Fisheries Research Board of Canada, Progress Reports of the Pacific Coast Stations, No. 110, pp. 6-12.

Recommendations for disposal of pulp mill waste were made following a study of surface currents, salinity, temperature, dissolved oxygen, and effects of tidal action. Findings of the study are presented.

2094. Pillay, T. V. R. 1958. LAND RECLAMATION AND FISH CULTURE IN THE DELTAIC AREAS OF WEST BENGAL, INDIA. Progressive Fish Culturist, Vol. 20, No. 3, pp. 99-103.

Swamps embanked for reclamation in the deltaic areas of the Ganges in West Bengal, India, are locally known as bheris and utilized for the culture of grey mullets (Mugilidae), bhetki (Percidae), tengra (Siluridae), and prawns (Penaeidae and Palaemonidae). The production of fish from the bheris is estimated to be between 150 and 250 kg. per ha. After the swamps are reclaimed, fish are cultured along with the rice in the fields. A yield of 100 to 200 kg. of fish per hectare is obtained by this practice. By the adoption of improved methods of stocking and manuring, the production can be considerably increased. (Auth. abst.)

2095. Meister, A. L., and C. F. Ritzi. 1958. EFFECTS OF CHLORETONE AND M. S. 222 ON EASTERN BROOK TROUT. Progressive Fish Culturist, Vol. 20, No. 3, pp. 104-110.

Two currently used fish anesthetics, M. S. 222 (Tricaine methanesulfonate) and chloretone (chlorobutanol), were compared in experiments conducted at two temperature levels, 37° to 39° F. and 48° to 51° F., using a wide range of concentrations. Hatchery-reared eastern brook trout (Salvelinus fontinalis) were used as test fish. Three hundred and sixty-six fish were anesthetized with M. S. 222, and 342 with chloretone. Average times for anesthetization and recovery were determined for each drug, and all fish were held 10 to 40 days after treatment for examination. No initial or subsequent mortality was experienced with either drug. Practical field concentrations were established; on the basis of anesthetization and recovery time, M. S. 222 was judged the more favorable for fishery use. The literature relating to these drugs, as used on the Salmonidae, is reviewed; references to their physiological effects are given. A simple and inexpensive method of using M. S. 222 in the field is suggested. Additional information on costs and pounds of fish anesthetized per unit weight of drug are given. Effective concentrations at the above temperature levels are suggested for use on lake trout (Cristivomer namaycush), eastern brook trout, and Atlantic salmon (Salmo salar). (Auth. abst.)

2096. DeLong, D. C., J. E. Halver, and W. T. Yasutake. 1958. A POSSIBLE CAUSE OF "SUNBURN" IN FISH. Progressive Fish Culturist, Vol. 20, No. 3, pp. 111-113.

The striking similarity between lesions caused by exposing niacin-deficient chinook salmon (Oncorhynchus tshawytscha) to sunlight, and those lesions commonly called "sunburn" in production hatcheries, indicates that a positive relationship may exist between nicotinic acid nutrition and susceptibility to "sunburn" in fish. Eighteen days after feeding on a niacin-deficient diet, exposed fish developed typical "sunburn" lesions very similar histologically to those found in production fish. After replacement of the vitamin missing from the diet, recovery was rapid and a significant decrease in mortality occurred. (J. E. H.)

2097. Phillips, A. M., Jr. 1958. THE ORGANIC COMPOSITION OF BROOK AND BROWN TROUT BLOOD. Progressive Fish Culturist, Vol. 20, No. 3, pp. 114-116.

Analyses are reported for 16 of the organic components of the blood of brook and brown trout. The composition of the two trout species was similar except in two cases. The cholesterol content was higher in whole blood and blood serum of brown trout than in the comparable fractions of brook trout blood. The globulin was lower and the albumin higher in the serum of brook trout than in the serum of brown trout. High cholesterol, reduced albumin, and increased globulin are indexes of kidney infections in higher animals. A possible correlation was found between blood composition and kidney disease in these trout. (Auth. abst.)

2098. Tompkins, William A., and James W. Mullan. 1958. SELECTIVE POISONING AS A MANAGEMENT TOOL IN STRATIFIED TROUT PONDS IN MASSACHUSETTS. The Progressive Fish-Culturist, Vol. 20, No. 3, pp. 117-123.

Big Cliff Pond, Brewster, is a typical so-called "two-story" pond containing yellow perch, smallmouth bass, brown bullhead, and brown trout. Based on published reports and prior findings at another lake, partial poisoning of this pond was attempted by applying sufficient emulsifiable rotenone to provide a 0.2 ppm concentration in the 30-foot epilimnion layer.

Analysis of water samples taken 4, 24, and 72 hours after application of the rotenone revealed no rotenone below the 35-foot level with concentrations above 30 feet ranging from 0.1 to 0.3 ppm. On the second and third day following application, gill nets fished at 10 to 30 feet took no fish during the 48 hour period they were fished while those fished at 40 to 60 feet caught brown trout and large yellow perch. The total fish kill averaged 42.9 pounds per acre, which is believed to represent 70 to 85 percent of the total standing crop including trout. No species is believed to have been completely eradicated.

Such a partial poisoning is considered to be a useful management tool in the development and maintenance of artificial population structures more suited to the needs of anglers. Reapplication of rotenone will be dictated by the rapidity with which pre-poisoning population structure is assumed.

2099. Combs, B. D., and R. E. Burrows. 1958. AN EVALUATION OF BOUND DIETS. Progressive Fish Culturist, Vol. 20, No. 3, pp. 124-128.

Tests were conducted to determine the optimum amounts of commercial binding agents to be added to a test diet and to compare the growth rates of fish fed an identical diet--unbound, bound with salt, and bound with commercial products. A photocolorimetric method for measuring the maximum binding ability of various binding agents was developed, and the method was applied in the development of bound diets for feeding trials. Feeding trials with chinook salmon (Oncorhynchus tshawytscha) fingerlings for 10 weeks demonstrated that a 100-percent increase in food utilization could be attained by the use of adequately bound diets. Salt at the 2-percent level proved as efficient as any of the commercial binding agents in the test diet; therefore, the cost of commercial binding agents in comparison with the cost of salt makes their use difficult to justify in normal production operations. (R. E. B.)

2100. Hublou, W. F. 1958. THE USE OF MALACHITE GREEN TO CONTROL TRICHODINA. Progressive Fish Culturist, Vol. 20, No. 4, pp. 129-132.

Malachite green was used in three experiments to control Trichodina on live fingerling steelhead trout (Salmo gairdneri gairdneri) in hatchery troughs and on excised fins from infected steelhead. Concentrations of 1:200,000 to 1:800,000 killed Trichodina when subjected to a 90-minute treatment. After a 30-minute treatment followed by a 60-minute period in fresh water, a complete kill resulted from concentrations of 1:200,000 and 1:400,000--and approximately a 90-percent kill at 1:800,000. In a single pond, 300,000 infected steelhead were treated for an hour with a malachite green solution at a maximum concentration of 1:800,000 with good success. (Auth. abst.)

2101. Snieszko, S. F. 1958. NATURAL RESISTANCE AND SUSCEPTIBILITY TO INFECTIONS. Progressive Fish Culturist, Vol. 20, No. 3, pp. 133-136.

Review of modern concepts on the nature of nonspecific natural resistance to infectious diseases, with suggestions for application in fishery research. (Auth. abst.)

2102. Fromm, P. O. 1958. A METHOD FOR MEASURING THE OXYGEN CONSUMPTION OF FISH. Progressive Fish Culturist, Vol. 20, No. 3, pp. 137-139.

The oxygen consumption of individual fish was measured while they were confined in separate tubes of a constant-flow apparatus. Water was pumped from an aquarium to a constant-pressure chamber; from there it was permitted to flow via gravity through a bubble trap, the fish chamber, and then back into the aquarium. The rate of flow through the fish chamber was regulated by an adjustable

pinchcock. A semi-micro modification of the Winkler method was used to measure the dissolved oxygen content of the water. The oxygen consumption of the fish was calculated from measurements of the difference in the dissolved-oxygen content of the water entering and leaving the fish chamber and the rate of flow through the chamber. Data were presented to show how the apparatus was used in a study of the effect of chromium on the oxygen consumption of Micropterus salmoides. (Auth. abst.)

2103. Burrows, R. E., and B. D. Combs. 1958. LIGNASAN AS BACTERICIDE AND ALGAECIDE. Progressive Fish Culturist, Vol. 20, No. 3, pp. 143-144.

Lignasan (ethyl mercury phosphate 6.25 percent), when applied at a 1: 1, 000, 000 concentration for a 1-hour period at biweekly intervals, has proved effective for the control of branched and unbranched filamentous green algae in salmon rearing ponds. The same treatment technique and concentration have also proved effective for the control of bacterial gill disease when used either as a prophylactic or as a therapeutic, provided that specific recommended treatment methods are employed. (Auth. abst.)

2104. Fleener, George G. 1958. A METHOD FOR MARKING FISH WITH AN ELECTRICAL BURNING DEVICE. Progressive Fish Culturist, Vol. 20, No. 3, pp. 140-142.

This method involves complete removal of fins by searing. The searing tool and the procedure are described.

2105. Zhadin, V. I. 1958. THE APPLICATION OF RADIOACTIVE ISOTOPES IN HYDROBIOLOGY AND FISH-BREEDING (PRIMENENIYE RADIOAKTIVNYKH IZOTOPOV V GIDROBIOLOGII I RYBOVODSTVE). Priroda, Leningrad, 6, pp. 58-62.

The fertilization of ponds is a promising method of intensifying fish-breeding. Such a fertilization involved a series of complex biological transformations which were formerly hard to control. Now hydrobiologists can clear up any details of the circulation of substances in bodies of water and thus solve problems of fish-breeding. Radioactive isotopes of phosphorus, calcium, along with superphosphate, slaked lime and other mineral substances are used. By testing samples of phytoplankton, zooplankton, plants, animals, etc. with Geiger counters, the degree of absorption of the isotopes can be controlled. Fish to be "marked" are either kept for a certain time in a radioactive solution or are fed with radioactive food. Experiments have revealed that part of the fish move upstream, some stay where they are and only one third migrates downstream. The use of radioactive isotopes for marking purposes is a great help in the investigation of the existing species of water organisms, their habits and propagation. There is 1 photo, 1 figure and 10 references, 7 of which are Soviet and 3 English. (SOV/STEP Abst. No. 26-58-6-12/56)

2106. Kuznetsova, I. I. 1958. A "CHEMICAL THEORY" OF FISH MIGRATION ("KHIMICHESKAYA TEORIYA" MIGRATSII RYB). Priroda, Leningrad, 6: 102-104.

The author reports on the spawning habits of two Volga fish varieties: the sazan (carp) and the vobla (roach). They invariably choose recently inundated plots for spawning, but avoid places that have been covered by water over longer periods, to protect the spawn from enemies and to furnish the young fish with sufficient food. Hydrochemical observations have proved that the chemical composition of inundated plot water standing longer than five days, differs considerably from water of recent inundation, which shows an important increase especially of chlorine in the first few days of inundation. Hence it must be assumed that the above-mentioned fish are being guided by a "chemical scent". There is 1 diagram, 1 table and 1 Soviet reference. (SOV/STEP Abst. No. 26-58-6-30/56)

2107. Konovalov, P. M. 1958. THE ACCLIMATIZATION OF THE CASPIAN STURGEON IN THE ARAL SEA (AKKLIMATIZATSIYA KASPIYSKOY SEVRYUGI V ARAL'SKOM MORE). Priroda, Leningrad, 7: 106-107.

Recently, the Aral Sea has become an experimental field for the settlement of new fish species. Thus, eggs of the Caspian sturgeon Acipenser stellatus P. were transferred from the Ufa river delta to the Aral Sea, Mugil auratus R. and Mugil salies R. from the Bekovich Bay on the Caspain Sea, and very large amounts of Clupea harengus membras L. eggs by air from the Baltic Sea. This project is carried out by the Tsentral'naya proizvodstvenno-akklimatizatsionnaya stantsiya Ministerstva rybnoy promyshlennosti SSSR (The Central Industrial Acclimatization Station of the USSR Ministry of the Fish Industry) in cooperation with the local agencies of fish breeding and protection, in order to utilize the food resources, plankton and benthon, contained in the Aral Sea. Relevant investigations were made by a group of assistants of VNIRO under the direction of Ye. A. Yablonskaya. In all acclimatization experiments, the cold winter temperatures of the Aral Sea, where the temperatures of the water falls to 0°C up to a depth of 20 m, must be taken into consideration. The temperature of the deeper water expanses is not yet known, but indications are available that it is more positive. The sturgeon eggs are treated by the method of the hypophysis injection according to N. L. Gerbil'skiy before they are transferred from the Ural Delta to the Aral Sea. The small amounts of Acipsenser nudiventris resident in the Aral Sea do not cause much harm to the new species. In 1956, over 702, 000 sturgeons of the Acipenser stellatus P. species were transferred to the Aral Sea as compared with 9, 000 in 1950. Individual fish have reached a weight of 7 to 8 kg. The meat tastes well, although it is whiter in color than that of the Caspian Sea. Maturity sets in earlier than in the Caspian Sea. (SOV/STEP 26-58-7-28/48)

2108. Shemanskiy, Yu. A. 1958. THE "LANGUAGE"

OF FISH ("RECH' " RYB). Nauka i zhizn', 8, p. 42.

The article contains particulars on the science of hydroacoustics, especially on the role of sounds in the life of fish. The author tells how fish use sounds and ultrasounds to establish floating articles and obstacles. He explains the use of the hydrophone and how the sound is being utilized as a bait for fishing. (SOV/STEP Abst. No. 25-58-8-25/61)

2109. Tarasov, N. I. 1958. FISHES FEEDING ON BALANUS (RYBY - BALANOFAGI). Priroda, Leningrad, 9: 105-106.

The author discusses the feeding of fishes on two species of the acorn barnacle, Balanus improvisus Darwin and B. eburneus Gould and since there are no fish in the Caspian Sea feeding on these species, he suggests a transfer of such species of fish as Tautoga onitis, Sparisoma trocheli and Archosargus probatocephalus to the Caspian Sea from the Atlantic shore of the US. A team of hydrobiologists under the direction of Member Correspondent of the AS USSR L. A. Zenkevich has successfully transferred nereis and Syndesmya ovata from the Sea of Azov to the Caspian Sea. During the thirties, together with a group of ichthyologists, Professor B. S. Il'yin successfully transferred grey mullets from the Black Sea into the Caspian Sea. There are 2 Soviet references. (SOV/STEP Abst. No. 26-58-9-23/42)

2110. Ignatyeva, G. M. 1957. THE HATCHING GLANDS OF THE WHITE STURGEON - HUSO HUSO (L). Akademii Nauk SSSR - Biologia, Vol. 114, No. 4, p. 908. (translation)

The secretion of an enzyme which reduces the strength of the egg membranes before hatching is controlled by a number of factors which act differently according to the age of the embryo. Changes in the hatching gland with age were studied.

Results show that glandular tissue is formed long before secretion begins and that changes in the rate of secretion correspond to definite structural changes in the gland. The enzyme appears after stage 28; secretion increases up to a maximum at stage 35, and then pours into the perivitelline space. Secretion continues for three days after hatching, then decreases and ceases at 6 days after hatching. It is concluded that the condition of the gland is determined by the state of development of the embryo.

2111. Ignatyeva, G. M. 1957. MORPHOLOGICAL AND PHYSIOLOGICAL INVESTIGATION OF THE "HATCHING" GLAND IN STURGEON AT DIFFERENT INCUBATION TEMPERATURES. Doklady. Akademii Nauk SSSR - Biologia, Vol. 114, No. 5, p. 1132. (translation)

No significant differences were revealed in the dynamics of accumulation and secretion of hatching enzyme, its activity or structure of the "hatching" gland at comparable stages of development, and in the degree of differentiation of larvae at the stage of unitary hatching between the two groups undergoing comparison. The results of the investigation indicate stur geon embryos undergo successful development under different temperature conditions, confirming the previously postulated independence of the stage of larval hatching from temperature in the case of the sturgeon family of fish. (Auth. summ.)

2112. Ginsburg, A. S. 1957. FERTILIZATION IN THE STURGEON WITH ONE OR SEVERAL SPERMS. Doklady. Akademii Nauk SSSR - Biologia, Vol. 114, No. 2, p. 445. (translation)

To decide whether fertilization is normally effected by one or many sperms, eggs fertilized under different conditions were examined histologically. It is concluded that only one sperm cell penetrates the ovum when spawn is fertilized with very dilute sperm, a natural condition on the spawning grounds. Fertilization by several sperms is often observed experimentally if sperm is only slightly diluted, and also in the dry method though less frequently. Multiple penetration of sperm leads to disorganization of segmentation and of subsequent development.

2113. Semenovskaya, K. S. 1957. GONADS AND FERTILITY OF THE STURGEON-STERLET HYBRID. Doklady. Akademii Nauk SSSR - Biologia, Vol. 114, No. 1, p. 229. (translation)

Sturgeon, and even the fresh water variety, the sterlet, do not reproduce if kept in ponds. However, almost ripe spermatazoa have been found in sterlet kept in ponds and aquaria. The possibility of the hybrid (sturgeon-sterlet) being superior in this respect was investigated.

Gonads of both male and female hybrids developed normally the first year. In the third year retardation of gonadal growth and even degeneration were evident in many specimens. Only a few males developed ripe spermatazoa. This abnormal failure of gonadal development is clearly associated with unfavorable conditions in the ponds, including scarcity of food. Increasing the food supply and growth probably would lead to normal maturation of the gonads.

2114. Morozova, T. E. 1957. SIGNIFICANCE OF EXTERNAL AND INTERNAL FACTORS IN THE SEXUAL CYCLE OF PERCH (PERCA FLUVIATILIS). Doklady. Akademii Nauk SSSR - Biologia, Vol. 112, No. 6, p. 1129. (translation).

Experiments in aquaria showed that the only decisive factor in perch spawning is temperature; absence of light, sandy soil, and males had no influence on maturation or laying of roe.

Roe, examined in January, March, April, and just before spawning, had undergone structural change with appearance of fat droplets in the ooplasm. Fat droplet distribution may be grouped into four phases from just a few tiny droplets to a single large eccentric droplet. Hormone injection did not modify these phases. It was further found that the hypophysis hormone, independent of its source in the fish, evoked not only ovulation but, more importantly, caused gonadal maturity.

2115. Moiseev, P. A. 1957. THE DEVELOPMENT OF A RESIDENT OF THE SALMON (ONCORHYNCHUS) MASU MORPHA FORMOSANUS (JORDAN ET OSHIMA) IN THE RIVER SEDANKA BASIN. Doklady. Akademii Nauk SSSR - Biologia, Vol. 112, No. 1, p. 163. (translation)

A dam constructed in 1936 on the 12 km long Sedanka River (near Vladyvostok) completely dewatered downstream reaches. Since then a non-anadromous race of O. masu morpha formosanus has developed. Sexually mature 2-year old specimens, 150 and 155 mm long, were collected in 1950; sexually mature females, 200-220 mm long, were collected shortly afterwards. the fresh-water form of the salmon had previously been described only for Taiwan, Japan, and Korea.

2116. Thoits, Charles F., III. 1958. A COMPENDIUM OF THE LIFE HISTORY AND ECOLOGY OF THE WHITE PERCH MORONE AMERICANA (GMELIN). Massachusetts Division of Fisheries and Game Fisheries Bulletin #24, 16 pgs.

Distribution, description, food and feeding, growth, natural and artificial reproduction, embryonic development, genetics, behavior, population characteristics, parasites, predators and competitors, and relation to man are covered.

2117. Bridges, Colton H. 1958. A COMPENDIUM OF THE LIFE HISTORY AND ECOLOGY OF THE EASTERN BROOK TROUT SALVELINUS FONTINALIS (MITCHILL). Massachusetts Division of Fisheries and Game Fisheries Bulletin #23, 30 pgs.

Taxonomy, geographical distribution, local distribution, morphology, food and feeding, growth, reproduction, embryonic development, genetics, population characteristics, pathology, and relations to man are covered.

2118. Wich, Kenneth. 1958. A COMPENDIUM OF THE LIFE HISTORY AND ECOLOGY OF THE CHAIN PICKEREL ESOX NIGER (LeSUEUR). Massachusetts Division of Fisheries and Game Fisheries Bulletin #22, 23 pgs.

Taxonomy, geographical distribution, local distribution, description, food and feeding, growth, reproduction, embryonic development, hybridization, behavior, population characteristics, diseases and parasites, predators and competitors, and management are covered.

2119. McGary, James W., and Edward D. Stroup. 1958. OCEANOGRAPHIC OBSERVATIONS IN THE CENTRAL NORTH PACIFIC, SEPTEMBER 1954-AUGUST 1955. U. S. Fish and Wildlife Service, Department of the Interior, Special Scientific Report-Fisheries No. 252, 250 pgs.

This report presents the results of three oceanographic cruises to the temperate central North Pacific by the research vessels Charles H. Gilbert and Hugh M. Smith of the Pacific Oceanic Fishery Investigations, U. S. Fish and Wildlife Service. The cruises were confined to the area bounded roughly by 157°30'W. and 170°E. longitude and 20°N. and 49°30'N. latitude. The report includes the observed and interpolated data for the first two cruises and the plots of the various fields, such as salinity and dissolved oxygen, for all three cruises. (Auth. abst.)

2120. Coates, John A., and John E. Halver. 1958. WATER-SOLUBLE VITAMIN REQUIREMENTS OF SILVER SALMON. U. S. Fish and Wildlife Service, Department of the Interior, Special Scientific Report-Fisheries No. 281, 9 pgs.

Qualitative vitamin requirements of silver salmon (Oncorhynchus kisutch) were determined by feeding groups of fingerlings a complete vitamin test diet (casein 54, gelatin 15, corn oil 7, cod liver oil 2, dextrin 8, minerals 4, methionine 1.0, tryptophan 0.5, celluflour plus crystalline vitamins 8.5) as the control diet; and deleting one water-soluble vitamin at a time from the ration for the respective deficient lots. A 16-week feeding period resulted in vitamin deficiency syndromes appearing in triamine, pyridoxine, folic acid, biotin, pantothenic acid, inositol and choline deficient groups. Nicotinic acid, riboflavin and cyanocobalamine deficient lots gave inconclusive results, and under experimental conditions used no deficiency syndromes were observed for fish without ascorbic acid in the diet. (Auth. abst.)

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